Children's suggestibility for a happy, sad or angry event after a one-week delay

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Submitted to the Graduate Faculty as partial fulfillment of

the requirements for The Master of Arts Degree in Psychology

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Children 4- to 6-years-old \((N = 60)\) and 8- to 10-years-old \((N = 58)\) individually watched a cartoon story with one of three endings designed to elicit either happiness, sadness, or anger based on goal outcomes. Afterward children were given an interview that included false leading questions. One-week later, children were given a follow-up interview that assessed memory and suggestibility. Results indicated that levels of suggestibility did not differ across emotion conditions in 4- to 6-year-olds, but were significantly greater in the sad than the happy condition in 8- to 10-year-olds. In turn, suggestibility was found to decrease across age groups in the happy condition, but remained stable across age groups in the sad condition. Concerns were expressed with the angry emotional manipulation. Findings were discussed in respect to conflicting theories on emotion and memory and implications for children’s forensic testimony.
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DRM………Deese-Roediger-McDermott false memory paradigm (Roediger & McDermott, 1995)
FTT…………Fuzzy-trace theory
Chapter One

Children’s Suggestibility for a Happy, Sad, or Angry Event after a One-week Delay

Stemming from applied questions concerning children’s capabilities as eyewitnesses in court, many developmental researchers have examined the suggestibility of children’s memory for events laden with negative emotion. Results of these investigations remain inconsistent regarding how negative emotionality of an event influences the suggestibility of children’s memory (Bruck & Melyn, 2004). One possible explanation for the mixed findings in these investigations is the tendency to narrowly conceptualize emotion as the amount of negative emotional arousal (i.e., stress) an event elicits. Importantly, emotional events are also comprised of emotional valence (whether the event was negative or positive) and discrete emotional states (such as happy, sad, and angry) which could have important implications for children’s suggestibility beyond negative emotional arousal (Davis, Quas, & Levine, 2008; Levine & Pizzaro, 2006). However, these emotional factors have only recently been considered. Preliminary evidence indicates that children’s suggestibility may differ between valence states (Brainerd, Holliday, Reyna, Yang, & Toglia, 2010) and across different discrete emotional events (Levine, Burgess, & Laney, 2008). The goal of this present investigation was to extend upon these findings by examining younger (4- to 6-year-olds) and older (8- to 10-year-olds) children’s suggestibility of memory for positive (happy) and negative (sad and angry) discrete emotional events after a one-week delay.

In the following sub-sections the experimental evidence will be presented for how children’s suggestibility is influenced by each aspect of emotion: (a) emotional arousal, (b) emotional valence, and (c) discrete emotions. First, the inconsistent findings from
studies examining children’s suggestibility for negatively emotionally arousing events are reviewed. Second, the proposed influence of emotional valence on suggestibility is discussed. As a result of the paucity of research directly examining differences in children’s suggestibility for positive and negative events, this sub-section reviews two theoretical accounts of emotional valence and memory which have shown valence differences for false memory materials. The application of each theory for predictions of children’s suggestibility to positive and negative events is reviewed. Finally, emerging theory examining the influence of children’s emotional appraisals and discrete emotions on memory, with one investigation on young children’s suggestibility (Levine et al., 2008), is reviewed leading into the discussion of the present study.

**Suggestibility of Children’s Memory for (Negative) Emotionally Arousing Events**

Emotional arousal as it pertains to memory refers to the affective intensity the experienced event elicits, ranging from relaxing (low arousal) to highly excitable, anxiety-provoking, or agitating (high arousal). Many developmental studies have examined children’s memory for negative emotionally arousing (i.e., traumatic, stressful) events (for review see Fivush, 1998; Paz-Alonso, Larson, Castelli, Alley, & Goodman, 2009; Pezdek & Taylor, 2002; Price & Connolly, 2008). These studies are often classified into two categories based on the methodology employed (Paz-Alonso et al., 2009). Naturalistic research examines children’s memory for naturally occurring stressful or traumatic events (e.g., medical procedures, natural disasters) that cannot ethically be simulated in the laboratory. Laboratory research tests children’s memory for mildly-arousing laboratory based stimuli and events. Naturalistic research offers ecological validity, or the ability to generalize findings to contexts of forensic interest,
whereas laboratory research offers experimental control (i.e., internal validity) over the variables of interest (Paz-Alonso et al., 2009).

Across to-be-remembered materials and methodologies, children have showed that their memory reports can be quite accurate, with children as young as three-years-old providing accurate reports (Merrit, Ornstein, & Spicker, 1994). Additionally, children could give accurate memory reports even after a substantial delay (Fivush, Sales, Goldberg, Bahrick, & Parker, 2004; Peterson & Whalen, 2001). However, findings regarding the relationship between amount of negative emotional arousal (i.e., distress) and memory (i.e., free recall) remain inconclusive, with some studies showing a positive relationship (Brown et al., 1999; Goodman, Hirschman, Hepps, & Rudy, 1991; Peterson & Whalen, 2001) and others showing a negative relationship (Merrit, Ornstein, & Spicker, 1994; Quas et al., 1999; Peters, 1997; Stein & Boyce, 1995). Along with children’s recall, many of these studies examined children’s susceptibility to suggestive questioning techniques. Likewise, the findings regarding the relationship between amount of negative emotional arousal and suggestibility of children’s memory remain inconsistent.

In a 2004 publication, Bruck and Melnyk reviewed 15 studies that examined the effect of children’s emotional arousal during the to-be-remembered event on their subsequent suggestibility. In total eight of the 15 studies revealed a significant relationship between emotional arousal and suggestibility, with half showing greater suggestibility with increased emotional arousal and the other half showing less suggestibility with increased emotional arousal. One explanation for some of the differences may be the use of different to-be-remembered events. In the studies reviewed
by Bruck and Melnyk, 12 of them involved children’s memory for a stressful medical procedure while the other three were laboratory studies. Yet, even when similar events are compared, the findings remain incongruent. In addition, the relationship between emotional arousal and suggestibility appears to be complex. For example, Quas et al. (1999) found that children who had higher stress ratings during the process of an invasive medical procedure provided less accurate information in free recall and when prompted with an anatomical doll, but were less suggestible to misleading questions regarding the procedure. Moreover, as Quas and colleagues (2006) point out, this variability in results could also be a result of differences in the way arousal (i.e., stress) was measured and the ages of children.

Again constant in most of the studies reviewed by Bruck and Melnyk was the conceptualization of emotion as arousal. Only one of the 15 studies reviewed examined children’s suggestibility to misleading questions according to different discrete emotional states (Burgess, 2000; data published in Levine et al., 2008) and none of them directly compared positive and negative emotional events. Therefore, the mixed findings pertaining to emotion and children’s suggestibility could be a result of operationally defining emotion as arousal without considering emotional valence or specific discrete emotional states. One could expect children’s suggestibility to vary across positive and negative events and across different distinct negative emotions (e.g., sadness, anger, fear) elicited by an event. In spite of this, these aspects of emotion remain relatively unexamined in the children’s suggestibility literature. We will return to the unique study conducted by Levine et al. (2008) and discrete emotions a little later, but first attention will be turned to emotional valence and suggestibility. Recent theoretical efforts have
focused on how emotional valence and discrete emotions affect cognitive processes, including memory, leading to specific testable assumptions. These theories and corresponding research are reviewed next.

**Emotional Valence and Suggestibility of Children’s Memory**

Emotional valence as it pertains to memory refers to the affective direction of the event experienced, either positive or negative. Whereas particular attention has been paid to children’s memory and suggestibility for differing levels of emotional arousal for negative or stressful events, few studies have examined the differences for positive and negative emotional events. This is an important area of inquiry because many researchers examine children’s memory and suggestibility for affectively positive events (e.g., science demonstration, magic show, pizza chef game) with the intention of applying these findings to the courtroom (e.g., Bruck, London, Landa, & Goodman, 2007; Kulkofsky, Wang, & Ceci, 2008; Poole & Lindsay, 1995). Specifically, if children display differences in memory and suggestibility for positive and negative events, then studies examining positive events may not generalize to forensic contexts, in which children are usually questioned about affectively negative experiences. Also, the examination of suggestibility between positive and negative events might help to explain some of the extant mixed findings between emotion and children’s suggestibility.

Current theoretical and empirical research examining false memories suggests that children’s memory and suggestibility may differ in positive and negative valence states (Brainerd et al., 2010; Brainerd, Stein, Silveira, Rohenkohl, & Reyna, 2008; Schwarz & Clore, 1983; 2007; Storbeck & Clore, 2005). However, findings are inconsistent depending on the theory and the methodology employed. In the social
psychology literature, the affect-as-information hypothesis (Schwarz & Clore, 1983; 2007; Storbeck & Clore, 2005) proposes that individuals use different information processing strategies when they are in positive and negative valenced emotional states, which results in heightened susceptibility to false memories in positive emotional states. A hallmark of studies that provided support for the affect-as-information hypothesis, which used primarily adult samples, was to employ a subtle mood manipulation (e.g., music) prior to administering a neutral testing stimulus (e.g., word list). Thus, these studies examined the role of incidental positive or negative affect (i.e., affect not associated with the stimulus or event of interest) prior to encoding on subsequent memory processes. Alternatively, other studies theoretically rooted in fuzzy-trace theory (FTT) found that negative valenced states resulted in higher rates of false memory in older children and adults when the materials themselves contained the positive or negative emotion (Brainerd et al., 2010; Brainerd, Stein, et al., 2008). The opposing theories are summarized in Table 1. Below, the affect-as-information hypothesis and FTT account are reviewed separately along with corresponding empirical evidence. Furthermore, each perspective’s possible application to children’s memory and suggestibility for events is evaluated.

**Affect-as-Information Hypothesis.** According to the affect-as-information hypothesis proposed by Schwartz and Clore (1983, 2007) positive and negative emotions serve as cues regarding one’s environment that guide how one attenuates and processes information. Positive affect signifies that one’s environment is benign and serves as an affective cue to maintain the status quo. Thus, under such circumstances individuals tend to rely on heuristic processing strategies since these are sufficient to maintain the current
### Table 1

**Theories on emotional valence and memory.**

<table>
<thead>
<tr>
<th>Theory</th>
<th>Emotional Valence</th>
<th>Implications for Memory</th>
<th>False Memory (DRM) Findings</th>
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<tbody>
<tr>
<td>Affect-as-Information Hypothesis</td>
<td>Positive</td>
<td>Heuristic processing strategy with increased reliance on general knowledge structures and greater likelihood for memory intrusions</td>
<td>Positive &gt; Negative</td>
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<tr>
<td></td>
<td>Negative</td>
<td>Systematic processing strategy leading to more careful memory judgments</td>
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<tr>
<td>Fuzzy-Trace Theory</td>
<td>Positive</td>
<td>Reduced reliance on gist memory traces</td>
<td>Negative &gt; Positive</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>Increased reliance on gist memory traces and suppression of verbatim memory traces</td>
<td></td>
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</tbody>
</table>

An individual using a heuristic processing strategy relies on top-down processing of prior knowledge structures or schemas (Schwarz & Clore, 2007). In contrast, negative affect signifies a threat or problem with a current goal and serves as an affective cue to change or adapt to the current situation. Under these circumstances an individual is motivated to alter his or her current emotional state and tends to employ more systematic or item-specific processing. By way of promoting different modes of information processing one’s emotional valence state has significant implications for later memory. Specifically, a positive emotional state will result in a gist-based memory with a broad scope in which the individual draws from prior knowledge to fill in the gaps in information (Levine & Bluck, 2004). Consequently, an individual may provide a more liberal memory account when in a positive emotional state, describing more information overall, but increasing the likelihood of including memory intrusions (Bless et al., 1996). Alternatively, a negative emotional state will result in an item-specific memory with a narrow range of focus and more conservative memory judgments (Levine & Pizarro, 2006).
Empirical findings, mostly from studies conducted with adults, support that different emotional valence states lead to differences in information processing and subsequent memory. In a series of studies, Bless et al. (1996) examined how induced happy or sad mood states affected participants’ memory for an event script presented within a story (e.g., going out to a restaurant). Participants were given a surprise recognition test about the story which included script typical information, script atypical information, and information unrelated to the script. For each type of information half of the recognition items actually occurred in the story and half did not. Across the three studies, the findings showed that happy participants were more likely to recognize script typical information independent of whether or not the detail was included in the story. Alternatively, sad participants were more conservative with recognition judgments making fewer intrusion errors regarding script typical information. Overall, the results displayed that individuals in a positive emotional state rely more on general knowledge structures in reconstructing the story leading to more script consistent inferences and intrusion errors than individuals in a negative emotional state. However, in opposition to the affect-as-information hypothesis, Bless and colleagues found that the increased reliance on general knowledge structures in a happy mood state was not a result of diminished cognitive capabilities or processing motivation, as individuals in a happy mood state were just as likely to systematically process script atypical details and perform better on a secondary task than individuals in a sad mood state.

Storbeck and Clore (2005) examined participants’ susceptibility to memory intrusions under positively and negatively valenced emotional states using the Deese-Roediger-McDermott paradigm (Roediger & McDermott, 1995). The Deese-Roediger-
McDermott (DRM) paradigm consists of presenting participants with word lists, each of which has a semantically related critical lure not presented in the list. After being presented with the list participants are asked to recall as many words as they can, sometimes falsely including the non-presented critical lure. The total number of critical lures recalled across the lists is used as a measure of false memory. Storbeck and Clore (2005) found that participants in an induced sad emotional state reported significantly fewer critical lures (i.e., made fewer memory intrusions) than participants in an induced happy or neutral emotional state. A second study showed that a sad mood state reduced the accessibility of the critical lures at encoding. Therefore, Storbeck and Clore concluded in line with the affect-as-information hypothesis that a sad mood state results in a more conservative, item-specific style of information processing leading to the reduction of false memories. Furthermore, the findings were explained within the framework of FTT as the authors’ suggested that negative mood states impaired gist processing. As explained later, however, subsequent research by the authors who originally put forth the FTT (Brainerd et al., 2010; Brainerd et al., 2008) examining false memory in different valence states used FTT to explain the opposite pattern.

Collectively, these laboratory studies have shown that a positive emotional state promotes the use of a heuristic information processing strategy which results in a memory account that relies on pre-existing knowledge structures and is susceptible to memory intrusions, whereas a negative emotional state leads to an item-specific account with more conservative memory judgments. Yet, there are limitations to applying these findings to children’s memory and suggestibility research and their capabilities as eyewitnesses. One caveat is that the studies employ incidental emotion or a mood
manipulation not associated with the materials being asked to be remembered. Coupled with this, the studies used memory materials that may not generalize to real-world event memories. In terms of forensic applicability, the major question at hand is whether children’s memory and suggestibility is affected by the arousal and the valence of an event. Therefore, of importance for eyewitness testimony is whether a happy or negative valenced event leads to the use of different processing strategies and outcomes for the memory of the event.

Considering this limitation, Levine and Bluck (2004) examined the differences between positive and negative emotional states on individuals’ memory for a real world occurrence. Specifically, Levine and Bluck assessed participants’ emotional reaction and memory regarding the televised announcement of the verdict in the criminal trial of O.J. Simpson. One week after the event participants’ emotional ratings of the ‘not guilty’ verdict were taken. Memory recognition for true events and false plausible events was examined at two separate times. Two months after the event participants’ clarity of the true and false plausible events were examined. At fourteen months after the event participants received a surprise recognition test with additional true and false plausible events. The results indicated that individuals who were happy about the ‘not guilty’ verdict recalled events with greater clarity at two months and recognized more events at fourteen months, independent of whether the event had occurred, than individuals whose initial reaction was negative. Participants whose initial reaction was negative were more accurate and conservative with their memory judgments making fewer false alarms. Thus, Levine and Bluck contend that for happy memories individuals tend to “paint with broad strokes,” remembering more details of the event at the expense of potentially
including false plausible inferences (Levine & Bluck, 2004, p. 571). In particular this study shows that, compared with a negative emotional state, a positive emotional state can lead to greater memory malleability over time in a real-world event.

A second limitation regarding the generalizability of the aforementioned studies was the use of adult samples. Thus, it is unclear whether children employ similar processing tendencies in opposing valence states and at what age children may use emotional valence as a cue for information processing. There have been a few developmental studies that have compared children’s memory reports for positively and negatively valenced events that provide support for different information processing styles. Fivush et al. (2003) examined 5- to 12-year-olds narratives for positive and negative events. Findings indicated that, while amount of recall was similar, negative memories contained more emotional content and were more coherent whereas positive memories included a wider range of information about the event. Another study examined children’s suggestibility for positively and negatively valenced events. Paz-Alonso and Goodman (in preparation) had 8- to 12-year-old children watch either a positively or negatively valenced video. After watching the video, half of the children in each video condition received misinformation about the video prior to memory being tested in an interview. In the interview all children received specific misleading questions about the video. The findings showed that children who viewed a negative event were less susceptible to misleading questions than those who viewed a positive event, but only if no misinformation was provided prior to memory being tested.

Collectively, these few developmental studies display that children’s memory for a positively valenced event does indeed differ from memory for a negatively valenced
event. Consistent with theory and adult research on emotional valence and memory, there is limited support that children’s positively valenced memories include a wider range of information (Fivush et al., 2003) and are more suggestible (Paz-Alonso & Goodman, in preparation). However, further research is needed to examine if children employ a heuristic processing style in a positive emotional state and a systematic processing style in a negative emotional state.

A final limitation of studies that examined the affect-as-information hypothesis and memory is that they equate positive valence with the specific emotion of happiness and negative valence with the specific emotion of sadness. Hence, this research is not examining the differences in information processing and memory between positive and negative valence states generally, but rather between happy and sad emotional states specifically. Other studies have found that the affect-as-information hypothesis may not apply to positive and negative valence states more broadly. For example, Corson and Verrier (2007) found in a study similar to Storbeck and Clore (2005) that false recall and false recognition of critical lures for DRM word lists was greater for high arousal emotional states (happy and angry) than low arousal emotional states (serene and sad) regardless of the valence. The authors concluded that emotional arousal and not emotional valence was the important factor in susceptibility to false memory. However, there could be an alternative explanation to these findings. Tiedens and Linton (2001) showed across a series of studies that emotions of certainty, such as happiness and anger, promote heuristic processing, whereas emotions of uncertainty, such as sadness or fear, promote systematic processing. Thus, in the study conducted by Corson and Verrier, happy and angry emotional states may have lead to increased rates of false memory not
due to increased arousal, but because these emotions of certainty promoted heuristic
processing. Yet, this remains to be empirically verified. Regardless of the underlying
explanation, these findings display the importance of considering discrete emotions in
addition to emotional valence.

Overall, research examining the effects of emotional valence on memory
stemming from the affect-as-information hypothesis implies that individuals are more
vulnerable to false memories in a positive emotional state. However, the research has
focused primarily on incidental affect and adult samples. In contrast, studies stemming
from FTT have examined false memory for negatively and positively valenced materials
across development with dissenting results (Brainerd et al., 2010; Brainerd et al., 2008).
The FTT account is considered next.

**Fuzzy-Trace Theory (FTT).** Fuzzy-trace theory (FTT) is a broad model of
cognition that has been applied to many specific cognitive domains, including false
memory and suggestibility in children and adults (Reyna & Brainerd, 1995; Brainerd &
Reyna, 2004). FTT contends that individuals encode separate episodic memory traces for
the surface content (verbatim traces) and meaning or semantic content (gist traces) of an
experience (Brainerd & Reyna, 2004; Brainerd, Reyna, & Ceci, 2008). Hence, verbatim
traces are precise representations of the experience, whereas gist traces are interpretive
representations that capture the essence (i.e. meanings, relations, patterns) of the
experience (Brainerd & Reyna, 2002; 2004). Furthermore, verbatim and gist traces are
processed simultaneously, but are encoded, stored, and retrieved independently from one
another (Brainerd & Reyna, 2002; 2004). Subsequent memory performance is dependent
upon the mixture of independent verbatim and gist traces at the time of retrieval.
(Brainerd & Reyna, 2004). Whether certain verbatim or gist traces are retrieved differ depending on the types of retrieval cues present and the delay between experience and retrieval, as well as individual difference factors such as age and prior knowledge (Reyna & Brainerd, 1995; Brainerd & Reyna, 2004). Specifically, verbatim traces are forgotten more rapidly than gist traces, leading to the increased propensity to use gist traces as a delay increases (Brainerd & Reyna, 2004).

In the context of false memory, FTT indicates that both verbatim and gist traces can support true memory for experienced items or events (Brainerd & Reyna, 2002). However, gist traces also support meaning related false memories, whereas verbatim traces lead to the suppression or rejection of meaning related false memories that were not part of the given experience (Brainerd & Reyna, 2002; Brainerd, Reyna, et al., 2008). Thus, whether a semantically or meaning related non-presented item or detail is endorsed or rejected in a recall or recognition test depends on opponent processes (Brainerd, Reyna, et al., 2008). For this reason, according to FTT, false memory responses are increased in experimental procedures that strengthen gist traces relative to verbatim traces, such as in the aforementioned DRM false memory procedure (Brainerd, Reyna, et al., 2008). To elucidate, when an individual is presented with the DRM word list semantically associated with the word sleep (e.g., bed, rest, awake, tired, dream, etc.) it increases false memory for the non-presented critical lure (sleep) because the semantically associated words strengthen the gist trace of the relevant meaning (i.e., words having to do with sleep) (Brainerd, Reyna, et al., 2008). Alternatively, if an individual was to correctly reject the critical lure, one would have to either (a) remember the exact words presented in the list (i.e. verbatim traces) understanding that the critical
lure (*sleep*) was not presented, or (b) fail to make the meaning connection across words presented in the list.

Explaining suggestibility effects in accordance with FTT becomes somewhat more complex. In traditional suggestibility paradigms, false information is presented from an external source (i.e. interviewers) through misleading questions after the participant experienced a to-be-remembered event. Participants are later questioned to examine if they falsely assent to the misinformation. The false material that is presented is typically regarding very specific details in the event that would rely on access to verbatim traces of the event to correctly reject any false information (Reyna & Brainerd, 1995). As a result, suggestibility effects under such circumstances could cognitively occur for multiple reasons. Similar to errors made in false memories, suggestibility effects may occur because participants are accessing gist representations of the event that do not necessarily refute specific false details (Reyna & Brainerd, 1995). However, suggestibility effects could also be the result of unspecified verbatim representations. Specifically, participants could be accessing verbatim representations for the event as well as the misleading interview without accessing verbatim representations for the source of that information (Reyna & Brainerd, 1995). Thus, participants may access verbatim traces of what was suggested during misleading questions and incorrectly attribute that to the event. Furthermore, suggestibility effects may be displayed for social reasons, such as compliance and conformity to the interviewer, which need to be considered in addition to or in conjunction with endogenous cognitive factors.

Additionally, FTT has been used to explain developmental trends in false memory and suggestibility, including the counterintuitive empirical findings that support
developmental reversals in suggestibility (for review see Brainerd, Reyna, et al., 2008). A common finding in child suggestibility studies is that suggestibility decreases with age (Bruck & Ceci, 1999; Ceci & Bruck, 1993; Ceci, Ross, & Toglia, 1987). However, in certain contexts it has been shown that older children are actually more suggestible and susceptible to false memories than younger children. Brainerd, Reyna, et al. (2008) contend that since both verbatim and gist memory improves with age one would expect to see different findings depending on the methodology employed. In short, susceptibility to suggestion and false memory will decrease with age in experimental paradigms that are sensitive to older children’s superior verbatim memory abilities and will increase in experimental paradigms that are sensitive to older children’s superior gist memory abilities (Brainerd, Reyna, et al., 2008, p. 348). Brainerd, Reyna, et al. (2008) showed in their review of data that older children are more susceptible to false memories in the DRM paradigm and for categorized materials as well as are more suggestible to events with increased meaning connectedness than younger children. Therefore, in contexts that strengthen gist traces relative to verbatim traces, older children and adults should be more susceptible to false memory and suggestibility than younger children.

One context proposed by Brainerd, Reyna, et al. (2008) for future applied research examining developmental reversals in false memory and suggestibility was emotionality. Superficially, FTT would appear to be complimentary to the affect-as-information hypothesis regarding predictions of emotional valence on false memory and suggestibility. If positive emotion leads to the use of heuristic processing it should strengthen gist traces relative to verbatim traces of the experience. Similarly, if negative emotion leads to the use of item-specific processing it should strengthen verbatim traces
relative to gist traces of the experience. Thus, positive emotional states should result in increased false memories relative to negative emotional states because positive emotional states support gist representations, whereas negative emotional states support verbatim representations. Furthermore, differences between positive and negative emotional states in false memory and suggestibility should be more pronounced with increases in age. In particular, if positive emotion strengthens gist traces then false memory and suggestibility should increase with age in positive emotional states. Alternatively, if negative emotion strengthens verbatim traces then false memory and suggestibility should decrease with age in negative emotional states. However, subsequent research examining false memory for emotionally valenced materials has not empirically supported this logically adduced theoretical connection (Brainerd et al., 2010; Brainerd, Stein, et al., 2008). In fact, as previously stated, the exact opposite pattern has been shown.

In an initial developmental study examining false memory for emotional materials, Howe (2007) examined 8- and 12-year-olds performance on recall and recognition measures for neutral and negatively valenced DRM word lists. Negatively valenced DRM word lists were adapted from a procedure used by Budson et al. (2006). Howe found that both true and false recall rates and true recognition rates were higher for neutral lists than negative lists, but false recognition rates were higher for negative emotional lists. Also, false memory increased with age for both neutral and negative word lists, implying that the emotional content did not suppress age increases in false memory on the DRM.

Extending upon this preliminary study, Howe, Candel, Otgaar, Malone, and Wimmer (2010) conducted multiple studies examining false memory in children and
adults for similar neutral and negatively valenced DRM word lists. As in Howe (2007), findings showed that true and false recall and true recognition rates were higher for neutral lists, but false recognition rates of critical lures was higher for negative emotional lists. This pattern was displayed in both adults (Experiment 1) and children (Experiment 2). Age trends were replicated as well, as false memory increased from 7-year-olds to 11-year-olds for neutral and negative emotional lists (Experiment 2). Beyond these results, Howe et al. examined the persistence of false memories for neutral and negative list information in adults (Experiment 3) and children (Experiments 4 and 5). In these studies, half the participants received recognition tests directly after being presented the DRM lists and the other half were given recognition tests after a one-week delay.

Findings across studies showed that, while true recognition rates for neutral and negative items decreased after the delay, false recognition rates remained stable for neutral items, but increased for negative emotional items. Thus, false alarms increased over time for negative emotional information.

Overall, studies by Howe and colleagues (Howe, 2007; Howe et al., 2010) indicated that negative emotional information leads to increased false memory relative to neutral information. However, this was restricted to recognition items. Moreover, negative emotional information results in increased false alarms and decreased true recognition across time. As noted by Brainerd and colleagues (Brainerd et al., 2010; Brainerd, Stein, et al., 2008), these findings are confounded by the fact the emotional lists not only varied in valence, but also varied in arousal. Consequently, the negative emotional lists may have resulted in increased false alarm rates to recognition items because of the higher arousal of the negative word lists as opposed to the negative
valence of the word lists. Imperative then was to examine if positive emotional materials, controlled for arousal, displayed similar or different effects compared to negative emotional materials.

Brainerd, Stein et al. (2008) administered negatively valenced, neutral, and positively valenced DRM word lists to adult participants. Negative and positive emotional word lists were statistically controlled for arousal. Findings on recognition measures revealed a linear pattern of false memory, such that negative emotional lists had higher rates of false memory for critical lures than neutral lists and neutral lists had higher rates than positive emotional lists. Negative emotional lists also had higher rates of true memory and lower rates of response bias (i.e., recognition of unrelated distractors). These findings suggest that increases in false memory rates may be unique to negatively valenced materials in contrast to the affect-as-information hypothesis. Further investigation in this study of the memory processes that produced the valence effects indicated that negative valence foments false memory primarily by promoting increases in meaning familiarity between words (i.e. strengthening gist) and secondarily by reducing access to verbatim representations.

In a following study, Brainerd et al. (2010) examined the effects of emotional arousal and emotional valence on false memory across development. Emotional DRM word lists (Cornell/Cortland Emotion Lists; CEL) were created that systematically varied the emotional arousal (high and low) and emotional valence (positive and negative) of the words presented in lists and associated critical lures. Procedurally, emotional DRM word lists (low arousal/negative, high arousal/negative, low arousal/positive, and high arousal/positive) were presented to 7-year-olds, 11-year-olds, and young adults in blocks
followed by recognition tests. As expected, false memory increased (7-year-olds < 11-year-olds < 20-year-olds) and overall net accuracy decreased with age across all lists. For emotion, valence was found to be a more important factor than emotional arousal. Specifically, false memory rates were higher for negative versus positive emotional word lists in 11-year-olds and 20-year-olds, but not 7-year-olds. In contrast, compared with negative lists, positive emotional lists had higher true memory rates and more pronounced age increases in true memory. Emotional arousal of lists had effects on false and true memory rates too, albeit to a lesser extent than valence. In particular, high emotional arousal word lists had higher rates of false and true memory than low emotional arousal word lists. Taken together, findings of valence and arousal imply that false memory rates were greatest for emotional lists with negative valence and high arousal, and this rate increased with age. These findings are particularly alarming because it would suggest that older school aged children and adults are most susceptible to false memories in the emotional context in which they are questioned about in the legal environment, namely highly arousing negative events.

In sum, studies examining false memory using emotional DRM word lists consistently found that negatively valenced lists foment higher rates of false memory for recognition items (i.e. false alarms) than neutral or positively valenced lists regardless of arousal level. This finding is inconsistent with the prediction derived from the affect-as-information hypothesis that negative valence should result in lower rates of false memory because it promotes item-specific processing (Storbeck & Clore, 2005). However, the findings reported above can be explained by FTT. Simply put, negative valence appears to support gist processing, storage, and retrieval while at the same time interfere with
verbatim processing, storage, and retrieval (Brainerd et al., 2010; Brainerd, Stein, et al., 2008). Stronger gist representations for negative emotional materials explain the higher rates of false memory (Brainerd et al., 2010; Brainerd, Stein, et al., 2008; Howe, 2007; Howe et al., 2010) and more pronounced increases in false memory with age (Brainerd et al., 2010). Also, stronger gist representations can explain why negative emotional materials increased false memory rates over time (Howe et al., 2010) as stronger gist representations are more likely to persist over time relative to verbatim representations. Reduced verbatim representations for negative emotional materials would explain the lower rates of true memory compared to neutral (Howe, 2007; Howe et al., 2010) or positive (Brainerd et al., 2010) emotional materials. Collectively, improved gist memory and diminished verbatim memory would explain the more marked decreases in net accuracy with age for negative emotional materials (Brainerd et al., 2010). Therefore, consistent with FTT one would expect false memory to be higher for negative events than positive events and for this difference to be more pronounced with increases in age.

Going forward it becomes important to establish which theoretical account will better apply to predictions regarding children’s memory and suggestibility for emotional events. A chief concern is how the affect-as-information hypothesis and FTT arrived at inconsistent results when proposing similar underlying cognitive mechanisms (i.e., gist processing). One reason for inconsistent findings may be the different experimental procedures employed to elicit emotion. Hence, an a priori mood induction could lead to results consistent with the affect-as-information hypothesis, whereas when emotion is elicited from the to-be-remembered materials (e.g., word list, event) results may be consistent with FTT. However, as previously shown there are some studies with results
consistent with the affect-as-information hypothesis that examined emotional events (Levine & Bluck, 2004; Paz-Alonso & Goodman, in preparation). Regardless, a relative strength of the studies used to support FTT was that the to-be-remembered materials contained the negative and positive emotion. These experimental conditions better approximate children’s memory and suggestibility for positive and negative emotional events in which the event is either positively or negatively valenced and is what elicits the emotional response. Furthermore, FTT was used to study false memory for emotional materials across development as opposed to only examining adult samples. For these reasons, FTT appears to be the better candidate to make predictions regarding children’s memory and suggestibility for emotional events.

However, as with the affect-as-information hypothesis, there are some limitations in applying the FTT account to children’s suggestibility research. One major limitation with the FTT account in general was that higher false memory for negative emotion was limited to recognition measures and was not displayed in recall measures. As explained by Howe et al. (2010), if negative valence resulted in increased gist, then both recall and recognition measures should display higher rates of false memory. Howe and colleagues (Howe, 2007; Howe et al., 2010) found that false recall rates were actually higher for neutral materials compared to negative materials. Again, these findings are limited because the materials also differed in arousal in addition to valence. Thus, it remains to be empirically examined if negative emotional materials cause greater rates of false recall than positive emotional materials as Brainerd and colleagues (Brainerd et al., 2010; Brainerd, Stein, et al., 2008) did not include recall measures in their studies.
A second limitation for FTT is that the findings are limited to studies of false memory using word lists. As previously explained, suggestibility in accordance with FTT is much more complex. In addition to cognitive factors of suggestibility (i.e., increased gist), negative emotional events may increase children’s susceptibility to social demands of suggestive interviewers. Thus, it becomes difficult to tease apart the effects of emotional valence on endogenous (i.e. cognitive) and exogenous (i.e. social) causes of suggestibility across development (Brainerd, Reyna, et al., 2008).

Finally, as with the affect-as-information hypothesis, the memory materials used may not generalize to children’s memory and suggestibility for events. Emotional word lists used in FTT studies better approximate conditions of applied interest, but it is debated whether memory for DRM word lists generalizes to false memory and suggestibility for events (see Pezdek & Lam, 2005). Moreover, the studies using emotional word lists made no distinction of discrete emotional states that may be evoked by certain word lists. For example, a negative event could result in a specific emotional state of anger, sadness, or fear all of which according to appraisal theories have different motivations. Different motivations associated with discrete emotions can lead to differences in memory even when the emotional valence is the same. Thus, emerging theory and research on discrete emotions and memory is reviewed next.

**Discrete Emotions and Suggestibility of Children’s Memory**

In accordance with cognitive appraisal theories (Frijda, 1987; Smith & Lazarus, 1993), Stein and colleagues’ (Stein & Levine, 1989; 1990; Stein, Liwag, & Wade, 1996, Stein & Liwag, 1997) model of emotional understanding, evaluation, and memory posits that the elicitation of discrete emotions depends on how one appraises an event in
correspondence to certain goal contingencies. This model is distinct from other appraisal theories in that it examines emotional appraisals developmentally, doing so through the use of children’s emotional narratives. Stein and Levine (1990) contend that there is a representational system that monitors subjective states and bodily reactions in order to facilitate the acquisition of desired states and avoid harmful environments. An assumption of the goal evaluation process model is that people want to achieve or maintain certain goal states that are beneficial for survival and adaptation to the environment. In conjunction with this assumption it is believed that an individual wants to attain certain desirable states and avoid aversive states. An additional assumption is that when individuals experience unpleasant states they attempt to regulate and change them (Stein & Levine, 1990). Goals then are constructed for achieving desired states or changing unpleasant states. Thus, the primary objective of the representational system is to attain or maintain a value state or avoid an aversive state (Stein & Levine, 1990). Also, the representational system must be sensitive to detecting change in the environment or internal states with respect to current values and goals. In order for an event to elicit an emotional reaction it must involve some aspect of novelty or violation of an expectation, a change in a valued goal status must be perceived, and an appraisal about the likelihood of maintaining, attaining, avoiding, or preventing a goal must be made (Stein & Liwag, 1997).

The specific emotion an event evokes depends on the goal-outcome of the appraised event (Stein et al., 1996). Specifically, six different goal-outcome states are possible. An individual can desire a goal and subsequently either want it and attain it, want it and not attain it, or want it but be uncertain of the goal’s attainment. Similarly, an
individual can have a goal that is considered undesirable (i.e. aversive) and subsequently either not want it and attain it, not want it and not attain it, or not want it but be uncertain of the goals attainment (Stein et al., 1996). Happiness, anger, sadness, and fear are differentiated by the goal-outcome relationships in conjunction with beliefs about reinstating or maintaining a goal (Stein & Liwag, 1997). Goal-outcome relationships for each discrete emotion and their corresponding implications for memory are summarized in Table 2. Goal-outcome states are unique for happiness and fear. In particular, happiness occurs when an individual wants something and attains it or when an individual does not want something (i.e. an aversive state) and is able to avoid it. Fear is associated with wanting something and being uncertain if the goal can be obtained and not wanting something but being unsure whether one can avoid it. Sadness and anger are evoked by the same goal-outcome relationships: wanting something and being unable to obtain it and not wanting something and being unable to avoid it. Consequently, sadness and anger overlap regarding events that cause these emotions, though can be distinguished by beliefs of goal reinstatement (Stein & Liwag, 1997).

Both loss states (when an individual has failed to maintain or attain a desired goal) and aversive states (when an individual cannot avoid an undesired outcome) can evoke sadness or anger (Stein & Levine, 1990). Thus, anger or sadness is evoked when a novel or unexpected element of an event jeopardizes a once attainable goal or avoidable aversive state and the impending loss or aversive state is perceived to be certain (Stein & Levine, 1990). Furthermore, while the same types of events cause the two emotions, it is also possible for individuals to experience both anger and sadness concurrently to the
same event (Stein & Levine, 1990). This is especially the case for young children (Stein & Levine, 1990; Stein & Liwag, 1997).

Table 2

*Goal outcome appraisals associated with discrete emotions and their implications for memory (Levine and Pizzaro, 2004, p. 543).*

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Appraisal of Event Goal Outcome</th>
<th>Implications for Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>Attainment of desirable state or avoidance of undesirable state</td>
<td>Use of heuristic processing where one pulls from established knowledge structures (i.e., schemas) and reports a wide range of information</td>
</tr>
</tbody>
</table>

Sadness

| Not being able to attain desired state (i.e., loss state) or unable to avoid undesirable state (i.e., aversive state) |
| Goal reinstatement is not possible (i.e., irrevocable goal failure). |

Anger

| Not being able to attain desired state (i.e., loss state) or unable to avoid undesirable state (i.e., aversive state) |
| Possibility of goal reinstatement (i.e., believe can overcome obstacle thwarting goal) |

| Enhanced memory for threat relevant information and poor memory for non-threat relevant details |

Fear

| Uncertainty regarding attainment of desired state or avoidance of undesirable state. |

Goal reinstatement differentiates whether an individual experiences anger or sadness. Specifically, sadness is experienced when a person believes goal reinstatement is not possible (Stein & Levine, 1989, 1990). Alternatively, if one believes that a thwarted goal can be reinstated then anger is experienced (Stein & Levine, 1989). Similar to anger, individuals who experience sadness desire to reinstate a failed goal, but their plan of action is characterized by goal abandonment or goal substitution (Stein & Levine, 1990). Consequently then, the focus on conditions that caused goal failure or thwarted goal attainment are characteristic of anger, whereas a focus on the consequences
of failure are characteristic of sadness (Stein & Levine, 1989). Other appraisal theories (Smith & Lazarus, 1993) argue that anger is distinct in that it is caused by harmful intentions of animate agents. Stein and colleagues (Stein & Levine, 1989; Stein & Liwag, 1997) contend that while an animate agent causing intentional harm generally results in anger, especially in adults, it is not the case that agency causing harm is necessary for anger. Anger may be evoked in circumstances not involving an animate agent, and the involvement of an animate agent intentionally causing harm does not always evoke anger (Stein & Levine, 1989). In particular, Stein and Levine (1989) found when asked to predict and explain people’s emotional responses to different types of events that preschoolers often attributed sadness to a person who was intentionally harmed by an animate object, whereas first graders and adults typically attributed anger. Lastly, both Stein and Levine (1989) and Stein and Liwag (1997) found some distinction between the types of events that evoke sadness and anger. Specifically, loss states more often evoked sadness, whereas aversive states more often evoked anger.

Once an emotion is evoked it directs present cognitions, behaviors, and responses accordingly to fit the demands of the person’s present emotional state (Davis et al., 2008). Thus, according to Levine and Pizarro (2004, 2006) discrete emotions such as happiness, anger, sadness, and fear which are associated with different appraised goal outcomes have specific implications for memory. Happiness results in the use of heuristic processing where one pulls from established knowledge structures (i.e. schemas) and reports a wide range of information. An angry emotional state leads to focusing on information relevant to one’s goals including agents or circumstances obstructing goals. A sad emotional state leads to focusing on failure outcomes, such as personal losses or
A fearful emotional state leads to enhanced memory for threat relevant information and poor memory for non-threat relevant details. Therefore, according to appraisal theory an individual’s discrete emotional state should lead to specific memory processes.

According to Davis et al. (2008) children’s emotional appraisals should reflect those of adults with a few notable differences. First, young children’s appraisals are less complex than those of adults. Children, especially young children, display a limited understanding of emotional ambivalence and the possibility of experiencing two different emotions concurrently. Second, children have limited attentional and emotional regulation capabilities. Taking into consideration these limitations for children, Davis et al. (2008) contend that children may display even stronger effects of discrete emotion on memory since their limited attentional resources will be devoted to central information congruent with the emotional appraisal. Currently there has only been one investigation on the effects of children’s discrete emotional states on memory and suggestibility.

Levine et al. (2008) conducted two studies examining the effects of discrete emotions on 4- and 6-year-old children’s memory and suggestibility. Examining happy, angry, and sad emotional states, the authors hypothesized that children in a sad emotional state would be more suggestible than children in a happy or angry emotional state. Children in a happy emotional state would be more resistant to suggestive questioning because happiness facilitates memory retrieval by activating elaborate networks of positive associations, and the happy emotional state will provide more self-assurance in one’s abilities. Similarly, an angry emotional state would lead to less suggestibility because anger promotes self-efficacy and a resistance to interpersonal exchanges.
Contrarily, children in a sad emotional state were hypothesized to be vulnerable to misleading questions because sadness leads to cognitive restructuring and is associated with low self-efficacy and help seeking.

In Levine et al.’s first study, 4- and 6-year-old children were presented three interactive stories each of which attempted to elicit a different target emotion: happiness, anger, and sadness. Thus, emotion elicitation condition and story were within-subjects factors. Stories were presented on a television monitor that the children were lead to believe was a touch-screen. In each of the three stories the child was asked to help a cartoon protagonist in a way that would allow the child to obtain a prize. To elicit happiness, the child was clearly presented with a target picture that they pressed to obtain the prize. To elicit anger, the child was clearly presented with the target picture, but did not receive a prize when he or she pressed it. To elicit sadness, the target picture was never presented to the child leading to goal failure. During the story, memory encoding was assessed by examining children’s recall half-way through the story. Next, the emotion elicitation procedure occurred. Following the story, a self-report measure of the child’s emotional state was taken. Children’s facial and behavioral expressions of emotion were also coded by independent observers using session videotapes. Afterward children’s free recall and responses to five false leading questions were examined. For analyses children were classified according to observer coded facial and behavioral expressions of emotion and their emotion elicitation condition. Results displayed no differences in overall recall across emotion elicitation conditions, but children who displayed sadness were significantly more suggestible than children who displayed anger.
or happiness. Due to the potential of carry-over effects, differences in stories, and problems with the emotion elicitation manipulation, a second study was conducted.

In the second study a between-subjects design was used in which each child heard a single, identical story. This was done to eliminate carry-over effects and to ensure participants were given information of equal memorability. An additional objective of the second study was to examine the reason for the heightened suggestibility of children in a sad emotional state. More specifically, Levine et al. investigated whether children in a sad emotional state agreed with the experimenter’s misleading questions knowing the statements to be false or whether the misleading information actually altered their representation of the event. To address this objective a second interviewer was included to reduce pressure for the child to comply with false information.

Children were randomly assigned to an emotion elicitation condition (sad, happy, or angry). First, each child heard the same negatively valenced story similar in structure to one used in the first experiment. Following the story, the child was given an autobiographical recall task asking the child to recall an instance where they experienced the assigned target emotion. Thus, the target emotion was elicited by the autobiographical recall task just prior to memory retrieval. Again, the child’s self-report of his or her current emotional state was taken after the autobiographical recall task. Next, the child experienced the first interview in which the experimenter asked ten leading questions, five of which were false leading. Following a brief distraction task a second experimenter entered the room and conducted an additional interview. In accordance with the first study, the results displayed no differences in overall recall across emotion elicitation conditions, but children in the sad emotion elicitation condition
agreed with more misleading statements to the first interviewer than did happy children. Also, sad children included more memory intrusions in recall to the second interviewer than did happy or angry children. Thus, the findings indicate that sad children incorporate misleading information into their memory representations of the story events.

Collectively, these findings convey the importance of considering children’s discrete emotions and emotional appraisals in suggestibility studies as even similarly valenced negative emotions had different effects. The two studies conducted by Levine et al. (2008) showed across different procedures for eliciting emotion and different methods for assessing emotions that children in a sad emotional state were more suggestible than children in a happy or angry emotional state. Additionally, the second study showed that this was not only due to a greater likelihood to assent to false misleading questions, but that children actually incorporated this false information into later reports. The authors contend that children in a sad emotional state may turn to adults, understanding that their own resources are inadequate to cope with the present outcome. This greater reliance leads to heightened suggestibility. Contrarily, children in happy or angry emotional states have greater feelings of self-efficacy allowing them to resist complying with false information.

As Levine et al. (2008) pointed out, there are limitations to the conclusions that can be drawn from their preliminary investigation on discrete emotions and suggestibility. One limitation is the narrow age range of 4- and 6-year-olds for children included in the study. Levine et al. imply that older children would be less likely to rely on other’s assistance in understanding emotional events which may make them less susceptible to misinformation from others in a sad emotional state. Moreover, as
previously shown in emotional false memory studies providing support for FTT (Brainerd et al., 2010; Brainerd, Stein, et al., 2008), emotion plays an increasingly important role in cognitive underpinnings of false memory with age. Hence, older children may continue to display heightened suggestibility after experiencing a sad emotional event because the negative emotion promotes gist memory traces while suppressing verbatim memory traces, which are conditions that make older children more vulnerable to memory errors than younger children (Brainerd, Reyna, et al., 2008). Yet, it remains to be examined whether findings from FTT regarding false memory for emotional materials across development extend to children’s suggestibility for emotional events and whether increased false memory in negative valence states may be limited to specific negative discrete emotions (i.e., sadness). In sum, older children may be less susceptible to social factors (i.e., self-efficacy) of suggestibility associated with discrete emotions than younger children, but may be more vulnerable to cognitive factors (i.e., gist memory). For these reasons, research is needed to examine whether heightened suggestibility to sad emotional events continues throughout development.

Also, examining children’s suggestibility to discrete emotional events over a wider range of development will help to clarify inconsistencies in findings amongst the affect-as-information hypothesis, FTT, and appraisal theories of emotion. Consistent with the affect-as-information hypothesis, Levine et al. (2008) suggest that in the absence of reliance on others sadness may foster careful memory judgments. In addition, other theorizing and research by Levine and colleagues (Levine & Bluck, 2004; Levine and Pizarro, 2004; 2006) examining discrete emotions and memory would suggest predictions in line with the affect-as-information hypothesis. Specifically, happiness has been shown
to increase heuristic processing and schema consistent memory errors for an event (Levine & Bluck, 2004). Anger has displayed similar processing strategies to happiness, whereas sadness promotes more careful event evaluations (Tiedens & Linton, 2001). However, as explained above, these predictions are inconsistent with what would be expected according to FTT and with the findings of Levine et al. concerning suggestibility in 4- and 6-year-olds. Levine et al. indicated social factors as the reason for young children’s suggestibility, such that when an individual depends on others for guidance or assistance he or she becomes vulnerable to suggestive information. Moreover, this would be especially the case for young children whose emotional resources are limited and who are dependent on adult’s assistance to cope with the sad situation (Levine et al., 2008). Older children may need less emotional support, but may show greater differences in suggestibility between emotions due to cognitive factors (Brainerd et al., 2010; Brainerd, Reyna, et al., 2008). Thus, the inclusion of older children in an investigation of children’s suggestibility for discrete emotional events would allow for evaluation of the different theories as the cognitive mechanisms proposed in these theories should play an increased role with increases in development. Nevertheless, including older children does not preclude that the cognitive factors involved in suggestibility of discrete emotional events will be studied in isolation, as social factors involved with emotion and suggestibility, while maybe reduced, are not eliminated with age.

A second limitation noted by Levine et al. (2008) was the short time interval between the event and the assessment of memory. In both studies memory was tested in the same session in which the child experienced the story. Forensically relevant is how a
child’s emotional state and introduction to misinformation in an initial interview influences his or her memory report after a delay. Additionally, including a delayed interview will better examine if children’s representations of events change due to certain emotional states. Recall in Experiment 2 Levine et al. (2008) showed that young children in a sad emotional state actually changed their reports to include misinformation when questioned by a second interviewer. However, the second interview was conducted briefly after (3 minutes) the first interview when emotion elicitation and memory traces were still fresh. Thus, of importance is how initial emotion and misleading information alter children’s recollection of the event when the emotion is no longer present and memory traces have decayed. This may be especially pertinent for older children’s reconstruction of negatively valenced events as the increased gist processing at the time of the event may lead to increases in intrusion errors and assents to false information when reconstructing the event after a delay (i.e., Howe et al., 2010).

The Present Study

The purpose of the current study was to further examine the effects of discrete emotions (happy, sad, and angry) on children’s memory and suggestibility by including a wider age range of children (4- to 6-year-olds and 8- to 10-year-olds) and by assessing memory after a one-week delay. By expanding this research, the present study sought to accomplish the following: (a) elucidate previous inconsistent findings regarding emotional valence and false memory by examining across development whether children are more suggestible to a positive or negative event; (b) advance the research on developmental reversals in false memory for emotional materials (Brainerd et al., 2010) by investigating whether similar patterns are displayed across development for
suggestibility of discrete emotional events; (c) ascertain whether valence effects
displayed in false memory studies may be limited to specific emotions. From an applied
perspective, this study aimed to further understand the emotional contexts beyond arousal
that increase the vulnerability of child witnesses’ memory to suggestive interviewing
practices.

In the present study two age groups (4- to 6-year-olds and 8- to 10-year-olds) of
children engaged in an interactive cartoon designed to elicit one of three distinct
emotions; happiness, sadness, or anger. In comparison to the simple narratives used by
Levine et al. (2008) the story featured a more complex narrative about a protagonist who
needed the child’s help to find his lost dog. Across emotion conditions the story was
identical except for the sequence designed to evoke the specific emotion. In accordance
with appraisal theories (Stein & Levine, 1989; 1990), emotional ending sequences
deliberately manipulated the child’s goal outcome to evoke the corresponding emotional
response. Following the story, children participated in a suggestive interview in which
baseline recall was assessed prior to presenting the child with misleading questions.
Resistance to misleading questions was assessed. After a one-week delay, the child was
interviewed by a second experimenter. In this follow-up interview, children’s recall and
responses to recognition items were assessed.

The following hypotheses were made in respect to the effects of happy, sad, and
angry emotional events on children’s memory and suggestibility across age groups. First,
age group was predicted to have these main effects irrespective of emotion conditions: (a)
the amount of correct information given in free recall sessions will increase from young
(4- to 6-year-olds) to old (8- to 10-year-olds) children for both baseline recall and recall
at the one-week follow-up interview; (b) suggestibility will decrease from young to old age groups. Specifically, suggestibility was expected to decrease with age (as opposed to increase with age as would be expected if developmental reversals in suggestibility were displayed) because a standard suggestibility methodology that was sensitive to older children’s age improvement in verbatim memory was employed (Brainerd, Reyna, et al., 2008). However, while suggestibility is expected to decrease overall with age, it may be that differences between emotional conditions become more marked with age (see below).

Second, emotion condition in conjunction with age group had the following predictions. Consistent with the results of Levine et al. (2008), young children in a sad emotional state were expected to be more suggestible than young children in an angry or happy emotional state. In the older age group, however, there are two potential outcomes based on previous theory and research. If findings are consistent with the affect-as-information hypothesis (Storbeck & Clore, 2005) and other studies with adults (Bluck & Levine, 2004) one would expect older children to become relatively more suggestible in happy and angry emotional conditions, but relatively less suggestible in sad emotional conditions. In particular, older children may rely less on adults for help in understanding sad emotional events and be more likely to engage in item specific information processing in a sad emotional state as proposed by the affect-as-information hypothesis, making older children in the sad emotional condition more resistant to suggestive information. At the same time, older children would be more likely to engage in heuristic information processing (i.e., improvements in gist memory with age) in happy and angry emotional states (Tiedens & Linton, 2001) that would result in heightened susceptibility
to suggestive information. Therefore, if findings are consistent with the affect-as-information hypothesis an interaction would be expected wherein the young age group would be relatively more suggestible to the sad event, but children in the old age group would be relatively more suggestible to happy and angry events, while suggestibility is decreasing overall between age groups.

Conversely, if findings are consistent with FTT (Brainerd et al., 2010; Brainerd, Stein, et al., 2008) one would expect that children in the older age group will remain more suggestible to the sad event than the happy and angry event and that the differences between emotional events may actually increase in this age group. Older children may be less reliant on adults in sad emotional states, but would remain more suggestible to the sad event for cognitive reasons proposed by FTT (i.e. increased gist traces and reduced verbatim traces). Moreover, as indicated by Brainerd et al. (2010) these cognitive mechanisms associated with negative emotions become increasingly more influential with age. As a result, differences between emotional events may become more marked as age increases. If this happens to be the case, then direct age reversals in suggestibility would not be expected (i.e., increases in overall suggestibility with age), but rather more marked differences between emotion conditions within conventional age decreases in suggestibility. In other words, it would be expected that across age groups, children will be more suggestible to the sad event, but between age groups, differences in suggestibility between the sad event and the other emotion conditions will be more marked in the older age group. Coincidentally, older children could remain suggestible to the sad event for the same socioemotional reasons as young children (see Levine et al., 2008, p. 692). However, explanations relying solely on social influence without a
corresponding change in underlying memory representation are unlikely in this study since memory was examined after a one-week delay by a new interviewer.

**Method**

**Participants.** Participants were 80 4- to 6-years-olds (young group) and 61 8- to 10-years-olds (old group). Children were recruited from Toledo, Ohio metropolitan area preschools and after-school programs. Written parental consent was attained for all participants, and each participant assented to the procedure on the day of testing. The study was approved by the Institutional Review Board at our University.

Overall 23 (20 young) of the participants did not complete the study or were initially excluded. Specifically, nine participants were unavailable for the second testing session, seven participants discontinued participation prior to completion (i.e., became bored and asked to stop), three participants displayed a response bias (i.e., answered yes to all questions), two participants were unable to complete the first testing session after starting (i.e., parents arrived to pick up child), and two participants did not understand the task. Participants lost or excluded were not significantly different across randomly-assigned emotional conditions. As a result 60 young (30 females) and 58 old (30 females) child participants who completed both testing sessions remained for further analyses.

Participants were randomly assigned to emotional conditions in either the young or old groups. In the young age group, remaining participants ranged in age from 4 years 0 months to 6 years 11 months in age ($M = 5$ years 3 months, $SD = 8.63$ months). In the old age group, remaining participants ranged in age from 7 years 11 months to 11 years 2
months ($M = 9$ years $4$ months, $SD = 10.98$ months)$^1$. A breakdown of the number of participants included by each age in years in each age group is displayed in Table 3. The ethnicity of children was predominantly Caucasian (81%), but included African American (11%), Hispanic (3%), Middle Eastern (2%), and other/unknown (3%) ethnicities.

Table 3

*Number of Participants by Age*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Age in Years</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young (4- to 6-year olds)</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Old (8- to 10-year olds)</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td></td>
</tr>
</tbody>
</table>

**Design.** The study employed a 3 (emotion condition: happy, sad, or angry) x 2 (age-group: young or old) between-subjects factorial design. In each age group, children were randomly assigned to one of three different versions of an interactive cartoon story designed to elicit a target emotion of happiness, sadness, or anger based on goal outcomes.

**Materials.** Three versions of a computer animated cartoon with corresponding audio were created using Toon Boom Studio 5 animation software. The cartoon creation was an intensive process, involving about 100 hours of drawing, editing, and voiceover.

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$^1$ A provision was made to allow children just about to turn 8-years-old and children who just turned 11-years-old to participate in the old group. This was done to boost the sample of the old group to a size comparable to the young group.
However, the cartoon was important since we sought to have stimuli that were identical except for different endings to elicit different emotional states. Also imperative was to have a stimuli that involved the child’s participation, which our animated cartoon did. The cartoon versions were scripted, drawn, and animated by the thesis author. Drawings and animations were created using the animation software on a HP Pavilion laptop computer. Adult voice actors were used for the dialogue between cartoon characters.

Cartoon versions were identical except for the ending designed to elicit the specific target emotion. The cartoon story featured a protagonist named Owen who asks the participating child for help to find his lost dog. Together Owen, his friend Kayla, and the child participant go on a quest to find the lost dog. The cartoon was meant to be interactive so the child was given clues throughout to help the protagonist and thereby increase the investment of the child in the goal of helping the protagonist find his lost dog. Collectively, the cartoon was divided into six scenes. Table 4 displays a brief description of each scene and the three different emotional ending outcomes. The full script of the cartoon is presented in Appendix A.

Similar to Experiment 1 in Levine et al. (2008), the specific target emotion was related to participants’ ability to achieve the goal of helping the cartoon protagonist find his lost dog. To elicit the target emotion, each of the three cartoon versions had a different outcome in relation to the goal. Specifically, in the happiness condition, the participant helped the protagonist find his lost dog at the end of the cartoon. Thus, with the participant’s help, the goal was achieved. In the sadness condition the participant was unable to help the protagonist find his lost dog prompting irrevocable goal failure. Lastly, in the anger condition the participant ran out of time prior to finding the lost dog
resulting in a circumstance thwarting the participant’s ability to achieve the goal.

However, in contrast to Experiment 1 in Levine et al. (2008), the present cartoon was animated and consisted of a richer narrative making it developmentally appropriate for the older children included in this study. Animated cartoons were presented on a laptop computer with headphones. A digital audio recorder was used to record the suggestive and follow-up interviews.

Table 4

*Summary of Cartoon Scenes and Emotional Outcomes*

<table>
<thead>
<tr>
<th>Scene</th>
<th>Scene Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scene 1</td>
<td>When walking in the park, Owen loses his dog Scooter while talking with his friend Kayla.</td>
</tr>
<tr>
<td>Scene 2</td>
<td>Owen and Kayla search at places in the park getting help from people and clues along the way.</td>
</tr>
<tr>
<td>Scene 3</td>
<td>Owen and Kayla leave the park and search for Scooter at an ice cream shop.</td>
</tr>
<tr>
<td>Scene 4</td>
<td>Owen and Kayla go to Owen’s home to search and they make flyers to help find Scooter.</td>
</tr>
<tr>
<td>Scene 5</td>
<td>While hanging up flyers, Owen and Kayla get help from people and clues in town that lead them back to the park.</td>
</tr>
<tr>
<td>Scene 6</td>
<td>Owen and Kayla think Scooter may be playing hide-and-seek by the pond. They search one side of the pond and then the other side.</td>
</tr>
</tbody>
</table>

**Emotional Outcomes**

- **Happy**: Owen and Kayla find Scooter behind the rock.
- **Sad**: Owen and Kayla do not find Scooter behind the rock.
- **Angry**: The child runs out of time before Owen and Kayla can look behind the rock for Scooter.
Session 1: Cartoon and Suggestive Interview. Children were tested individually at their preschool or after-school site. The first experimenter was one of four different undergraduate research assistants who were blind to study hypotheses. Initially the first experimenter would obtain the child’s assent to participate and usher the child to the testing room. In the testing room, the experimenter seated the child in front of a laptop computer and administered instructions. The experimenter informed the child that they would be watching a cartoon with a boy named Owen and that Owen may need their help. Furthermore, the experimenter stated, “In order to help Owen you need to pay close attention to the cartoon.” The experimenter then helped the child with the headphones. When the child was ready the experimenter started the cartoon and monitored the child as they watched.

The child then proceeded to watch the randomly assigned cartoon version designed to elicit either happiness (9 minutes 28 seconds), sadness (9 minutes 38 seconds), or anger (8 minutes 49 seconds). Promptly following the cartoon, the experimenter approached the child with a different response depending on the emotional ending experienced in an effort to make the child’s goal outcome salient. Specifically, in the happy cartoon condition the experimenter congratulated the child on helping to find the lost dog and thanked them for their help. Alternatively, in the sad cartoon condition the experimenter pointed out that the child was unable to help find the lost dog and thanked them for trying. Finally, in the angry cartoon condition the experimenter remarked that the child’s time was up, pointed out that they were unable to help find the lost dog, and thanked them for trying. Directly following the tailored message, the experimenter instructed the child that there was a friend who would like to ask some
questions about the cartoon. The first experimenter then left the room to get the second experimenter, the suggestive interviewer.

Following the cartoon the child was administered a suggestive interview by a second experimenter. All suggestive interviews were conducted by a male experimenter who was blind to the emotion condition of the child. Upon entering the testing room the suggestive interviewer introduced himself to the child and gave brief warm-up questions to build rapport. Afterward the interviewer instructed the child that because he had not watched the cartoon story he did not know what happened and really needed the child’s help to understand the cartoon. The suggestive interview protocol followed a funnel format commonly employed in memory and suggestibility studies (Poole & Lindsey, 1995; Quas, Bauer, & Boyce, 2004). First, children were given an open-ended prompt instructing the child to tell the interviewer everything that happened in the story from beginning to end. Additional open-ended prompts were given when necessary to help facilitate additional free recall (i.e. “What else happened?” “Can you tell me more?”). Open-ended prompting continued until free recall was exhausted or the child insisted that they did not remember any more of the cartoon. Second, children were given five non-leading specific prompts regarding the content of the cartoon. In particular, children were asked (a) Can you tell me what happened when Owen was walking his dog Scooter in the park? (b) Can you tell me more about what happened when Scooter got lost? (c) Can you tell me about all the places Owen and his friend Kayla searched for Scooter? (d) Can you tell me about anything else that Owen and Kayla did to help find Scooter? (e) What happened at the end of the cartoon? Collectively, the open-ended and specific
questions were used to assess children’s baseline free recall of the cartoon prior to the presentation of any leading questions.

In the final segment of the interview, children were given true and false leading questions about story details following a technique used by Bruck, London, Landa, and Goodman (2007). The cartoon contained 23 target details across six scenes. Each (true) target detail in the cartoon was paired with a generated misleading (false) detail. For example, the true detail “Scooter chased a bunny rabbit” was paired with the false detail “Scooter chased a cat.” A complete list of true details with paired false details is shown in Appendix B. In sum, children were presented 6 true targets (referred to as true reminders) and 6 false targets (referred to as false reminders). Directly following the presentation of each true or false reminder, the child was asked a forced-choice question about that reminder in order to embed the reminder within the question. As an example of a false reminder, the interviewer said, “I heard that while walking in the park Scooter chased a cat.” The interviewer then directly followed this with a forced-choice question about the reminder (e.g., “Was the cat black or orange?”). During the suggestive portion of the interview each child heard 12 forced choice questions, 6 regarding true reminders and 6 regarding false reminders.

Overall each child received one true reminder and one false reminder for each of the six scenes of the cartoon. A true reminder was never presented with its paired false reminder and within each interview version true and false reminders were presented in a counterbalanced order. A total of four different suggestive interview versions were used across participants with each true and false reminded item being equally represented across interview versions. Children were randomly assigned to a suggestive interview
version such that each version appeared equally across emotion conditions and age
groups. The final reminder of each interview was regarding the goal outcome ending of
the cartoon. Content of the reminded information differed depending on the emotion
condition of the participant and whether this was a true or false reminded item. This final
item appeared equally as a true and false reminder across all three emotion conditions.
An example of an interview protocol is shown in Appendix C.

The interviewer began the suggestive portion of the interview by explaining that
he was told some of the things that happened in the cartoon by the first experimenter and
that he wanted to make sure he understood these things really well. He then proceeded to
ask the child 12 forced-choice questions containing true and false reminders. Reminders
were asked about in the temporal order in which the target detail occurred in the cartoon.
If a child resisted or challenged a reminder, the interviewer said “I just need to write
something down. So was the cat Scooter (the dog) chased black or orange?” In the event
the child continued to resist or challenge, the interviewer would then randomly choose an
option for the child (e.g., “So Scooter chased a black cat while taking a walk in the
park”). After the child picked an option, the interviewer then repeated the detail back to
the child. The same questioning method was used for true reminders. Also, throughout
the suggestive interview, the interviewer made supportive comments such as “Good
answer” and “You are such a great storyteller.” After all the reminders were presented
the interviewer slowly repeated each reminder (e.g., “You told me that Scooter chased a
black cat while taking a walk in the park”). The child was thanked for their participation
and Session 1 concluded. Interview length ranged from 8 to 15 minutes and the entire
Session 1 took between 20 to 30 minutes.
**Session 2: Exit Interview.** Approximately one week ($M = 7.47$ days, $SD = 1.73$, Range = 5 to 15 days) after the suggestive interview, a new experimenter visited the child’s site to conduct an exit interview. Exit interviewers were one of four female or male undergraduate research assistants who had not previously viewed the cartoon. They were blind to study hypotheses and the child’s emotion condition. After a warm-up, the interviewer asked the child if they remembered watching a cartoon with Owen. The interviewer further informed the child, “I was not here when you watched the cartoon story with Owen, so I don’t know what happened.” As in the suggestive interview, a funnel format was used in the exit interview. The open-ended and specific questioning sections were identical to the suggestive interview. First, the child was prompted to tell the interviewer everything that happened in the cartoon from beginning to end. The interviewer was instructed to use additional open-ended prompts (e.g., “Can you tell me more?” “Was there anything else?”) when necessary to elicit more free recall information. The interviewer then asked the same five non-leading specific prompts regarding the content of the cartoon. Together these two questioning sections were used to assess the child’s free recall and prompted recall after a one-week delay as well as the incorporation of misinformation from the suggestive interview into the child’s recall.

Afterward, children’s recognition of true and false target details were examined following the method used by Bruck et al. (2007). The interviewer instructed each child that if asked about something that did not happen in the cartoon, the child should say no. However, if asked about something that did happen, the interviewer instructed the child to say yes. Children were asked 23 direct yes/no questions about the target details of the cartoon. Specifically, children were asked six questions about the true reminded items
presented in the suggestive interview. Likewise, children were asked six questions about the false reminded items presented in the suggestive interview. The remaining 11 questions consisted of true and false control (non-presented) target items. Children were asked about five or six items that contained accurate information about the cartoon, but were not presented in the suggestive interview (referred to as *true non-reminders*). Similarly, children were asked about five or six items that contained false information about the cartoon, but were not presented in the suggestive interview (referred to as *false non-reminders*). The number of true non-reminders and false non-reminders the child received depended on the suggestive interview version the child was administered.

The inclusion of true details not presented in the suggestive interview allowed for evaluation of the *facilitative effect* of true reminded items. In other words, if presenting true target items in the suggestive interview helped to facilitate item recognition in the exit interview, then children should be more accurate responding to true reminded items than non-reminded items. Similarly, the inclusion of false details not presented in the suggestive interview allow for the evaluation of the *suggestibility effect* of the false reminded items. Thus, if presenting false items in the suggestive interview increased children’s level of false assent to these items in the exit interview, then children should have higher levels of false assent to the false reminded items than non-reminded items. As explained in Brainerd, Reyna, et al. (2008), because recognition tests involve guessing and other forms of response bias it is necessary to have a baseline rate of children’s false assent. Consequently, the effect of suggestibility in this study is not children’s assent rate to false reminded items, but instead is assessed by children’s assent rate to false reminded
items relative to children’s assent rate to non-reminded items or their baseline propensity to assent to false recognition items.

Two different exit interview versions were used. The two exit interviews matched-up with the four suggestive interviews ensuring that each true and false item was equally represented as a reminder and non-reminder across participants in each emotion condition and age group. Children were asked one recognition question about a true reminder, a false reminder, a true non-reminder, and a false non-reminder for each of the first five scenes in the cartoon. True and false paired items were never asked about in the same exit interview. Only three questions were asked about scene six. The first two questions about scene six appeared equally as true and false items and reminded and non-reminded items. The final question was regarding the goal outcome of the cartoon and was always about a true or false reminded item. Correct responses regarding this question differed depending on the emotion elicitation condition the child was assigned. Thus regarding scene six, children were always asked a true reminded and false reminded item along with either a true non-reminded or a false non-reminded item.

The interviewer asked the child recognition questions in the temporal order the target detail occurred in the cartoon. Children’s responses were marked on the interview protocol as well as audio recorded. After the interviewer was finished with the yes/no questions, he then went back over all items the child stated had happened in the cartoon (i.e., all questions to which the child assented). The interviewer instructed the child that he wanted to be really certain that these things happened in the cartoon. Each of the child’s responses was again marked and any shifts were noted. To conclude Session 2 children were thanked for their help and given a certificate for their participation.
Data Coding.

Baseline Recall. Recorded audio files of the open-ended and specific questioning segments of the suggestive interview were transcribed verbatim by undergraduate research assistants. A different pair of undergraduate research assistants, who were blind to study hypotheses, used the transcripts to code children’s responses to open-ended and specific questions. Correct and incorrect new utterances were coded in the open-ended and specific portions of the interview. An utterance was operationally defined as a statement bound by pauses containing one verb (as used by Bruck et al., 2007). Transcripts were coded in a series of steps. First, coders were instructed to cross out any off-topic utterances, requests for clarification, false starts, or any value statement that could not be coded for accuracy. Second, the remaining information was divided into utterances. Third, coders passed through the transcript again crossing out any information that was redundant or repeated. Fourth, each remaining utterance was coded as correct or incorrect. Lastly, the numbers of correct and incorrect utterances were counted for the open-ended and specific sections separately and also combined to form an overall total. A representative sample of 40 transcripts was coded by both coders to assess interrater reliability. An interrater reliability analysis between correct and incorrect utterances showed high agreement between coders (Kappa = .81). Each transcript coded by both coders was reviewed and any discrepancies were resolved through discussion. The remaining transcripts were coded by one of the two coders.

Exit Interview Recall. Coding of children’s recall in the exit interview was identical to coding of baseline recall with one addition to the fourth step. Specifically, utterances were categorized as correct or incorrect, but also as suggested or non-
suggested depending on if the utterance contained information derived from true or false reminders in the suggestive interview. Thus, utterances were coded as either correct suggested, correct non-suggested, incorrect suggested, or incorrect non-suggested. Again totals of each category were computed for open-end and specific sections separately and combined to form an overall total for each category. Since only a minor addition was made to the coding scheme, a smaller sample of 20 interviews was coded by both coders to assess interrater reliability. Agreement between coders on correct/incorrect and suggested/non-suggested utterance classification was high (Kappa = .80). Each transcript coded by both coders was reviewed and any discrepancies were resolved through discussion. The remaining transcripts were coded by one of the two coders.

**Recognition Item Scoring.** The numbers of accurate “yes” responses to true reminded and true non-reminded items were counted separately. Accuracy proportions for true reminded and true non-reminded items were calculated representing the number of accurate “yes” responses out of the total number of recognition items asked for each reminder type. Likewise, the numbers of false assents (i.e., “yes” responses) to false reminded and false non-reminded items were counted separately. Proportions of false assent for false reminded and false non-reminded items were calculated representing the number of inaccurate “yes” responses out of the total number of recognition items asked for each reminder type.

**Results**

**Preliminary Analyses.** Children’s baseline free recall narratives were reviewed to examine if the goal outcome received pertaining to a specific discrete emotion was correctly understood. In the happy emotion condition, all children in the young (n = 20)
and old age group ($n = 20$) correctly understood the happy goal outcome (that they helped the cartoon protagonist find his lost dog). However, three children (2 young) in the sad emotion condition and 11 children (6 young) in the angry emotion condition misunderstood their respective goal outcomes by incorrectly stating they helped the cartoon protagonist find his lost dog. These children were excluded from further analyses. In the sad emotion condition, 18 children in the young age group and 19 children in the old age group who correctly understood the goal outcome remained for subsequent analyses. In the angry emotion condition, 14 children in the young age group and 13 children in the old age group who correctly understood the goal outcome remained for subsequent analyses.

The high total of children who misunderstood the goal outcome in the angry emotion condition (29%) was particularly alarming and suggests that there was a problem with the goal outcome clarity and the emotional manipulation in the angry condition. Children who were confused about the goal outcome of the cartoon were unlikely to experience the corresponding emotion of anger. Removing these participants significantly reduces the cell sample sizes of the angry emotion condition for each age group in comparison to the happy and sad groups. In addition, even children who showed sufficient understanding in their free recall narrative of the angry goal outcome may have had some confusion about the goal outcome due to the ambiguous ending of the angry cartoon. Moreover, even if children correctly interpreted the goal outcome in the angry condition it does not necessarily follow that the child experienced anger. As previously stated, the same goal outcomes can result in anger or sadness. In particular, Levine et al. (2008) found in Experiment 1 using similar methodology that 73% of 4-
year-olds and 50% of 6-year-olds actually experienced sadness in the story condition designed to elicit anger. As a result of these concerns with the angry emotional manipulation, analyses for the exit interview measures are initially presented without the angry emotion condition. Afterwards, relevant analyses for the exit interview with the angry emotion condition included are presented.

Age in months within each age group and across emotion conditions was examined to assure each group had equivalent age representation. In the young age group, age did not differ across happy ($M = 65.29$ months, $SD = 9.54$), sad ($M = 64.12$ months, $SD = 7.15$), and angry ($M = 60.61$ months, $SD = 8.89$) emotion conditions, $F(2, 49) = 1.27, p = .29$. Similarly, in the old age group, age did not differ across happy ($M = 114.07$ months, $SD = 10.84$), sad ($M = 111.90$ months, $SD = 10.48$), and angry ($M = 110.20$ months, $SD = 10.07$) emotion conditions, $F(2, 49) = .578, p = .58$. Also, because cell sample sizes were imbalanced, suggestive interview versions were examined across age groups and emotion elicitation conditions to assure equal representation across factors. Chi-square tests were conducted and found no significant differences in the allocation of the four interview versions across the three emotional conditions for the young or old age groups, indicating that interview versions were equally represented across emotion conditions. These preliminary examinations rule out differences in age and interview versions within age groups as potential confounds to any differences displayed across emotion elicitation conditions.

**Suggestive Interview.**

**Baseline Recall.** The number of prompts given in the open-ended and specific portions of the suggestive interview was counted. A $3 \text{ (emotion condition)} \times 2 \text{ (age}$
group) ANOVA was conducted to examine if the number of prompts given differed as a function of emotion elicitation condition and age group. As would be expected, a significant main effect of age group was found, $F(1, 98) = 22.18, p < .001, \eta^2 = .19$. Younger children ($M = 14.67, SD = 3.53$) were given significantly more prompts than older children ($M = 11.87, SD = 2.79$). The number of prompts given did not differ across emotion conditions, $F(2, 98) = 0.47, p = .63$, and there was no significant interaction between emotion condition and age group, $F(2, 98) = 1.37, p = .26$.

Descriptive statistics for baseline recall measures are displayed in Table 5. Overall number of correct new utterances in the open-ended and specific portions of the suggestive interview was used to examine children’s baseline recall. A $3 \times 2$ ANOVA was conducted to examine if the number of correct new utterances given in recall differed as a function of emotion elicitation condition and age group. The main effect of age group was significant, $F(1, 98) = 72.89, p < .001, \eta^2 = .43$. As would be expected, older children ($M = 35.50, SD = 13.38$) recalled significantly more correct new utterances than younger children ($M = 17.12, SD = 8.44$). Correct new utterances recalled did not differ across emotion conditions, $F(2, 98) = 0.59, p = .55$, and there was no significant interaction between emotion condition and age group, $F(2, 98) = 1.37, p = .26$.

Additionally, the number of incorrect new utterances in the open-ended and specific portions of the suggestive interview was examined. A $3 \times 2$ ANOVA revealed no main effect of age, $F(1, 98) = 0.71, p = .40$, or emotion condition, $F(2, 98) = 0.14, p = .87$, and no significant interaction, $F(2, 98) = 0.68, p = .51$, indicating incorrect utterances did not differ as a function of emotion condition.
and/or age group. These findings indicate that emotion condition did not affect quantity or accuracy of children’s initial memory of the cartoon. Therefore, pre-existing differences in cartoon memory cannot explain any subsequent differences across emotion conditions.

Table 5

**Baseline Recall**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Emotion Condition</th>
<th>N</th>
<th>Correct Utterances M (SD)</th>
<th>Incorrect Utterances M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young (4- to 6-year olds)</td>
<td>Happy</td>
<td>20</td>
<td>18.50 (7.94)</td>
<td>1.95 (1.90)</td>
</tr>
<tr>
<td></td>
<td>Sad</td>
<td>18</td>
<td>17.00 (10.17)</td>
<td>1.83 (1.79)</td>
</tr>
<tr>
<td></td>
<td>Angry</td>
<td>14</td>
<td>15.29 (6.73)</td>
<td>1.64 (1.34)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>52</td>
<td><strong>17.12 (8.44)</strong></td>
<td><strong>1.83 (1.70)</strong></td>
</tr>
<tr>
<td>Old (8- to 10-year olds)</td>
<td>Happy</td>
<td>20</td>
<td>35.55 (13.59)</td>
<td>1.40 (1.60)</td>
</tr>
<tr>
<td></td>
<td>Sad</td>
<td>19</td>
<td>32.53 (11.67)</td>
<td>1.32 (1.00)</td>
</tr>
<tr>
<td></td>
<td>Angry</td>
<td>13</td>
<td>39.77 (15.20)</td>
<td>1.92 (1.44)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>52</td>
<td><strong>35.50 (13.38)</strong></td>
<td><strong>1.50 (1.36)</strong></td>
</tr>
</tbody>
</table>

**Resistance to Forced Choice Questions.** The number of forced choice questions resisted out of the six misleading (i.e., false reminded) questions was counted. On average, children only resisted 22% of the forced choice questions containing false information. A 3 (emotion condition) x 2 (age group) ANOVA was conducted on the number of resisted questions and revealed a significant main effect of age group, $F(1, 98) = 5.25, p = .024$, $\eta^2 = .05$. Older children (26.9%) resisted significantly more misleading forced choice questions than younger children (17%). Resistance to misleading questions (i.e., false reminders) did not differ across emotion conditions, $F(2, 98) = 0.84, p = .43$ and there was no significant interaction between emotion condition and age group, $F(2, 98) = 0.04, p = .96$. As a result, subsequent differences across
emotion conditions in the exit interview cannot be explained by children’s willingness to challenge or resist misleading forced choice questions during the suggestive interview.

**Exit Interview: Happy versus Sad Emotion Conditions.** In the following section, exit interview measures are presented with the angry emotion group excluded due to the aforementioned concerns.

Recall\(^2\). As in the suggestive interview, the number of prompts given in the open-ended and specific portion of the exit interview were counted and examined using a 2 (emotion condition) x 2 (age group) ANOVA. A main effect of age group was found, \(F(1, 72) = 4.45, p = .038, \eta^2 = .06\). Younger children (\(M = 10.21, SD = 3.32\)) were given significantly more prompts than older children (\(M = 8.82, SD = 2.43\)). The number of prompts given did not differ across emotion conditions, \(F(1, 72) = 0.43, p = .52\), and there was no significant interaction between emotion condition and age group, \(F(1, 72) = 1.74, p = .19\).

Descriptive statistics for exit interview free recall are shown in Table 6. A 2 (emotion condition) x 2 (age group) ANOVA was conducted on the number of overall correct utterances given in children’s exit interview recall. As predicted, older children (\(M = 26.21, SD = 11.96\)) had significantly more correct utterances in their exit interview recall than younger children (\(M = 15.66, SD = 8.50\)), \(F(1, 72) = 19.40, p < .001, \eta^2 = .21\). Overall correct utterances did not differ across happy and sad emotion conditions, \(F(1, 72) = 0.46, p = .50\), and there was no significant interaction between emotion condition and age group, \(F(1, 72) = 0.004, p = .95\). In addition, the number of correct utterances containing information presented in the forced choice questions (i.e., suggested correct

\(^2\) One child participant in the happy emotion condition and old age group did not have free recall data because their exit interview was not properly recorded.
utterances) was examined using a 2 x 2 ANOVA. Similarly, older children ($M = 5.32, SD = 2.63$) recalled significantly more suggested correct utterances than younger children ($M = 2.97, SD = 2.30$), $F (1, 72) = 16.55, p < .001, \eta^2 = .19$. Again, the number of suggested correct utterances did not differ across happy and sad emotion conditions, $F (1, 72) = 0.77, p = .38$, and there was no significant interaction between emotion condition and age group, $F (1, 72) = 0.26, p = .61$.

Table 6

**Exit Interview Recall for Happy and Sad Conditions**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Emotion</th>
<th>N</th>
<th>Overall Correct Utterances $M (SD)$</th>
<th>Suggested Correct Utterances $M (SD)$</th>
<th>Overall Incorrect Utterances $M (SD)$</th>
<th>Suggested Incorrect Utterances $M (SD)$</th>
<th>Net Accuracy of Utterances $M$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young (4 to 6)</td>
<td>Happy</td>
<td>20</td>
<td>16.50 (8.70)</td>
<td>2.60 (2.04)</td>
<td>1.95 (1.79)</td>
<td>0.50 (.89)</td>
<td>90.20%</td>
</tr>
<tr>
<td></td>
<td>Sad</td>
<td>18</td>
<td>14.72 (8.41)</td>
<td>3.39 (2.55)</td>
<td>1.67 (1.97)</td>
<td>0.39 (.61)</td>
<td>90.70%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>38</td>
<td>15.66 (8.50)</td>
<td>2.97 (2.30)</td>
<td>1.82 (1.86)</td>
<td>0.45 (.76)</td>
<td>90.43%</td>
</tr>
<tr>
<td>Old (8 to 10)</td>
<td>Happy</td>
<td>19</td>
<td>26.95 (12.99)</td>
<td>5.21 (2.25)</td>
<td>2.11 (2.60)</td>
<td>.47 (.61)</td>
<td>92.10%</td>
</tr>
<tr>
<td></td>
<td>Sad</td>
<td>19</td>
<td>25.47 (11.14)</td>
<td>5.42 (3.02)</td>
<td>3.05 (2.25)</td>
<td>.63 (1.07)</td>
<td>88.80%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>38</td>
<td>26.21 (11.96)</td>
<td>5.32 (2.63)</td>
<td>2.58 (2.45)</td>
<td>.55 (.86)</td>
<td>91.45%</td>
</tr>
</tbody>
</table>

Also, the number of overall incorrect utterances and incorrect utterances containing false information presented in the forced choice questions (i.e., incorrect suggested utterances) were examined in separate 2 (emotion condition) x 2 (age group) ANOVAs. On average, children included very few overall incorrect utterances ($M = 2.20, SD = 2.19$) and incorrect suggested utterances ($M = 0.50, SD = 0.81$) in their exit interview free recall. The number of overall incorrect utterances included in children’s exit interview free recall did not significantly differ across emotion conditions, $F (1, 72)$

---

3 Overall children showed a floor effect on overall incorrect and incorrect suggested utterances included in free recall, with many children providing zero incorrect utterances. As a result, the respective distributions are positively skewed. Transformations were considered, but these also were problematic. Analyses were conducted on the untransformed measures. As could be expected, these measures had too little variability between participants to detect any notable differences.
= 0.44, p = .51, or age groups, \( F(1, 72) = 2.39, p = .13 \), and there was no significant interaction, \( F(1, 72) = 1.52, p = .22 \). Likewise, the number of incorrect suggested utterances did not significantly differ across emotion conditions, \( F(1, 72) = 0.02, p = .90 \), or age groups, \( F(1, 72) = 0.33, p = .57 \), and there was no significant interaction, \( F(1, 72) = 0.51, p = .048 \). In sum, children’s free recall utterances during the exit interview were highly accurate (young: \( M = 90.43\% \); old: \( M = 91.45\% \)), with older children providing more correct utterances overall. Emotion condition had no effect on children’s recall, including no differences in the incorporation of suggested information in their narratives at the exit interview.

**Recognition Items.** Accuracy (i.e., “yes”) proportions for the true yes/no questions were examined using a 2 (emotion condition) x 2 (age group) x 2 (reminder type: reminded or non-reminded) ANOVA with repeated measures on the last factor (see Table 7). The analysis revealed two significant main effects. First, as expected, there was a significant main effect of reminder type confirming the facilitation effect of reminded items over non-reminded items, \( F(1, 73) = 41.45, p < .001, \eta^2 = .36 \). Specifically, mean accuracy proportion to true reminded recognition items (\( M = 0.94, SD = .10 \)) was significantly higher than true non-reminded recognition items (\( M = 0.80, SD = .19 \)) irrespective of age group and emotion condition. Second, there was a significant main effect of age group, \( F(1, 73) = 5.50, p = .022, \eta^2 = .07 \), with older children (\( M = 0.90, SD = 0.13 \)) having a higher overall mean accuracy proportion to true items than younger children (\( M = 0.84, SD = 0.16 \)). Beyond significant main effects, the emotion condition x age group x reminder type interaction was marginally significant, \( F(1, 73) = 3.07, p = .084, \eta^2 = .04 \). This marginally significant interaction was a result of the
greater difference between reminded and non-reminded true items in the happy condition than the sad condition in the younger age group (see Table 7). However, follow-up simple effect analyses comparing happy and sad emotion elicitation conditions in the young age group found no reliable differences between reminded true items ($p = .155, \eta^2 = .03$) or non-reminded true items ($p = .095, \eta^2 = .04$). Considering that the interaction and follow-up analyses were statistically non-significant and effect sizes were small there is not much support for these findings representing true differences in responses to true recognition items. The main effect of emotion and all two-way interactions were not significant.

Table 7

*Accuracy Proportion for True Reminders and Non-Reminders*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Emotion Condition</th>
<th>N</th>
<th>True Reminders $M(\text{SD})$</th>
<th>True Non-Reminders $M(\text{SD})$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>Happy</td>
<td>20</td>
<td>.94 (.10)</td>
<td>.70 (.24)</td>
</tr>
<tr>
<td>(4 to 6)</td>
<td>Sad</td>
<td>18</td>
<td>.90 (.12)</td>
<td>.80 (.15)</td>
</tr>
<tr>
<td>Old</td>
<td>Happy</td>
<td>20</td>
<td>.96 (.07)</td>
<td>.85 (.17)</td>
</tr>
<tr>
<td>(8 to 10)</td>
<td>Sad</td>
<td>19</td>
<td>.95 (.10)</td>
<td>.83 (.16)</td>
</tr>
</tbody>
</table>

Next, children’s suggestibility to recognition items was evaluated. A 2 (emotion condition) x 2 (age group) x 2 (reminder type: reminded or non-reminded) ANOVA with repeated measures on the last factor was conducted on false assent (i.e., “yes”) proportions to false yes/no questions (see Table 8). As with the true recognition items, there were two significant main effects for the false recognition items. First, as expected, there was a significant main effect of reminder type confirming the suggestibility effect of false reminded items over non-reminded items, $F(1,73) = 78.10, p < .001, \eta^2 = .52$. 

Specifically, mean false assent proportion to false reminded (i.e., suggested) recognition items ($M = 0.53, SD = .25$) was significantly higher than false non-reminded (i.e., control) recognition items ($M = 0.28, SD = .21$) irrespective of age group and emotion condition. Hence, children were suggestible to misinformation presented in the suggestive interview as rates of false assent to reminded items significantly exceeded baseline (i.e. non-reminded) rates of false assent. Second, there was a significant main effect of age group, $F (1, 73) = 8.84, p = .004, \eta^2 = .11$, with younger children ($M = .46, SD = .22$) having a higher overall false assent rate than older children ($M = .35, SD = .22$).

Table 8

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Emotion</th>
<th>N</th>
<th>False Reminders $M (SD)$</th>
<th>False Non-Reminders $M (SD)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>Happy</td>
<td>20</td>
<td>.61 (.21)</td>
<td>.29 (.21)</td>
</tr>
<tr>
<td>(4 to 6)</td>
<td>Sad</td>
<td>18</td>
<td>.62 (.21)</td>
<td>.34 (.25)</td>
</tr>
<tr>
<td>Old</td>
<td>Happy</td>
<td>20</td>
<td>.36 (.21)</td>
<td>.26 (.19)</td>
</tr>
<tr>
<td>(8 to 10)</td>
<td>Sad</td>
<td>19</td>
<td>.55 (.27)</td>
<td>.22 (.16)</td>
</tr>
</tbody>
</table>

However, these significant main effects were qualified by a significant emotion condition x age group x reminder type interaction, $F (1, 73) = 5.41, p = .023, \eta^2 = .07$. Simple effect analyses were conducted to tease apart the significant interaction. As shown in the top half of Figure 1, the young age group had no significant differences between happy and sad emotion conditions for rates of false assents to reminded and non-reminded items respectively. Both happy, Wilks’ $\lambda = .70, F (1, 73) = 31.45, p < .001, \eta^2 = .30$, and sad, Wilks’ $\lambda = .78, F (1, 73) = 21.11, p < .001, \eta^2 = .22$, emotion conditions in the young age group were suggestible as false assent rates to reminded items significantly
exceeded rates to non-reminded items (see Table 8). Moreover, rates of suggestibility were comparable for happy and sad emotion conditions in the young age group with the happy condition showing a slight greater nominal disparity between suggested and non-suggested items. The significant interaction occurs due to the differences between emotion conditions in the older age group displayed in the bottom half of Figure 1. In the happy emotion condition, suggestibility decreases from the young to old age group.

Specifically, rates of false assent to reminded items decreased significantly in the happy emotion condition from the young ($M = 0.61$) to the old age group ($M = 0.36$), $F (1, 73) = 12.18, p = .001, \eta^2 = .14$. As a result, the difference between rates of false assent to reminded and non-reminded items (i.e., the suggestibility effect) in the happy emotion condition and old age group was only marginally significant, Wilks’ $\lambda = .96, F (1, 73) = 3.25, p = .076, \eta^2 = .04$. In contrast, suggestibility remained stable in the sad emotion condition from the young to old age group. The difference between rates of false assent to reminded and non-reminded items in the sad emotion condition and old age group was significant, Wilks’ $\lambda = .70, F (1, 73) = 31.75, p < .001, \eta^2 = .30$. Lastly, in the old age group suggestibility was greater in the sad than the happy emotion condition. In particular, rate of false assent to reminded items was higher in the sad condition ($M = 0.55$) than the happy condition ($M = 0.36$), $F (1, 73) = 7.17, p = .009, \eta^2 = .09$, whereas rates of false assent to non-reminded (i.e., control) items were not statistically different.
Figure 1. Young and old children’s mean rates of false assent to false reminded and non-reminded recognition items in happy and sad emotion conditions
Exit Interview: Angry Emotion Condition Included. Exit interview analyses with the angry emotion condition included were conducted. In free recall measures, the inclusion of the angry condition did not change any of the findings above. Older children recalled significantly more overall correct utterances and suggested correct utterances about the cartoon than younger children. Emotion condition continued to have no effect on any of the free recall measures. For true recognition items, the inclusion of the angry emotion condition resulted in similar findings. Specifically, the facilitation effect of higher accuracy for reminded items than non-reminded items remained. As did the main effect for age group, with older children having a higher accuracy to true items overall than younger children. However, the emotion condition x age group x reminder type interaction that was marginally significant without the angry condition was no longer close to significance \( p = .23 \) with the angry condition included.

False assents to false recognition items were examined using a 3 (emotion condition) x 2 (age group) x 2 (reminder type: reminded or non-reminded) ANOVA with repeated measures on the last factor and the angry emotion group included (see Table 9 for cell means). The main effect of reminder type (i.e., the suggestibility effect) remained significant, \( F (1, 98) = 80.24, p < .001, \eta^2 = .45 \), with reminded items \( (M = 0.54, SD = 0.25) \) having a higher false assent rate than non-reminded items \( (M = 0.30, SD = 0.22) \). Also, the main effect of age group remained, with younger children having a higher false assent rate overall than older children. However, the emotion condition x age group x reminder type interaction was no longer statistically significant with the angry condition included, \( F (2, 98) = 2.63, p = .077, \eta^2 = .05 \). Follow-up simple effect analyses were conducted to examine the marginally significant interaction. As shown in the top half of
Figure 2, children in the young age group and angry emotion condition displayed the suggestibility effect, Wilks’ λ = .91, F (1, 98) = 10.14, p = .002, η² = .09, as false assent rates to reminded items (M = 0.70) were higher than the rates to non-reminded items (M = 0.48). However, the suggestibility effect in the angry condition for young children is much smaller than the effect found in the happy and sad emotion conditions respectively for young children. One reason for the smaller effect is that young children in the anger condition have a significantly higher rate of false assent to non-reminded items than children in the happy and sad conditions (see Table 9). As with the happy emotion condition, suggestibility in the angry condition decreased from young to old age group. Specifically, rates of false assent to reminded items significantly decreased from young to old age groups in the angry condition, F (1, 98) = 10.40, p = .002, η² = .10. Rates of false assents to non-reminded (i.e., control) items also decreased from young to old age groups in the angry condition, F (1, 98) = 5.87, p = .017, η² = .06, albeit to a lesser extent. The difference between rates of false assent to reminded and non-reminded items (i.e., the suggestibility effect) in the angry emotion condition and old age group was only marginally significant, Wilks’ λ = .97, F (1, 98) = 3.55, p = .063, η² = .04. There were no significant differences found between the angry condition and the other emotion conditions for rates of false assent to reminded and non-reminded items respectively in the old age group. False assent rates to reminded items remained significantly higher for the sad condition compared to the happy condition in the old age group.

The results on the exit interview analyses with the angry condition included showed that suggestibility in the angry condition more closely approximated the happy emotion condition than the sad emotion condition. Specifically, suggestibility effects
decreased for the happy and angry emotion conditions from the young to the old age group, whereas levels of suggestibility remained stable (actually a slight nominal increase) across age groups in the sad emotion condition. Nevertheless, there are some notable limitations in drawing conclusions about angry emotion condition, as previously mentioned. As a result of the limitations in the anger manipulation (i.e., small cell sample size), the emotion condition x age group x reminder type interaction was only marginally significant when the angry emotion condition was included. In turn, the commentary in the discussion will center on the differences between the happy and sad emotion condition.

Table 9

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Emotion Condition</th>
<th>N</th>
<th>False Reminders M (SD)</th>
<th>False Non-Reminders M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>Happy</td>
<td>20</td>
<td>.61 (.21)</td>
<td>.29 (.21)</td>
</tr>
<tr>
<td></td>
<td>Sad</td>
<td>18</td>
<td>.62 (.21)</td>
<td>.34 (.25)</td>
</tr>
<tr>
<td></td>
<td>Angry</td>
<td>14</td>
<td>.70 (.21)</td>
<td>.48 (.22)</td>
</tr>
<tr>
<td>Old</td>
<td>Happy</td>
<td>20</td>
<td>.36 (.21)</td>
<td>.26 (.19)</td>
</tr>
<tr>
<td></td>
<td>Sad</td>
<td>19</td>
<td>.55 (.27)</td>
<td>.22 (.16)</td>
</tr>
<tr>
<td></td>
<td>Angry</td>
<td>13</td>
<td>.42 (.23)</td>
<td>.29 (.21)</td>
</tr>
</tbody>
</table>

Summary of Exit Interview Analyses. Older children provided more correct details about the cartoon in free recall than younger children. The amount of incorrect details included in free recall and overall accuracy of details did not differ across age groups. There were no differences found between emotion conditions on free recall measures. Regardless of age group and emotion condition, children were more accurate to reminded than non-reminded true items confirming the facilitation effect. Recognition
Figure 2. Young and old children’s mean rates of false assent to false reminded and non-reminded recognition items in happy, sad, and angry emotion conditions.
accuracy to true reminded and non-reminded items did not differ across emotion conditions within age groups. The most significant finding was regarding the false recognition items that assessed children’s suggestibility. Young children (4- to 6-year-olds) in the happy and sad emotion conditions showed similar high rates of suggestibility, as false assent rates were significantly higher to reminded items than non-reminded items. In the older age group (8-to 10-year-olds), children in the sad emotion condition had significantly higher rates of suggestibility than children in the happy condition. Across the age groups, suggestibility was found to decrease significantly from young to old in the happy emotion condition, but remained stable in the sad condition. When analyses included the angry emotion condition, the angry condition showed similar patterns to the happy condition, with suggestibility decreasing across age groups. However, concerns with the angry emotional manipulation preclude drawing any confident conclusions about the results of the angry condition.

Discussion

This study investigated the effects of a happy, sad, or angry event on young (4- to 6-year-olds) and old (8- to 10-year-olds) children’s memory and suggestibility. Children watched an interactive cartoon with one of three different endings designed to elicit the target emotion of happiness, sadness, or anger based on goal outcomes. Memory and suggestibility was assessed after a one-week delay using both recall and recognition measures. Concerns with the angry emotional manipulation necessitated that analyses be conducted without the angry condition. The main finding was in respect to suggestibility on recognition items between happy and sad conditions. Specifically, 4- to 6-year-olds were suggestible to misinformation provided in the initial interview regardless of which
emotional cartoon they experienced. Moreover, the rates of suggestibility did not differ between the happy and sad conditions in the young age group. In contrast, 8- to 10-year-olds were significantly more suggestible to the sad than the happy cartoon. Rates of suggestibility were found to significantly decrease across age groups in the happy condition, but remained stable across age groups in the sad condition (actually a slight nominal increase across age groups). The results of this study provide evidence that emotional valence and discrete emotions influence children’s suggestibility beyond emotional arousal. Additionally, the results extend upon previous developmental research examining emotional valence and false memory for emotional word lists (Brainerd et al., 2010) by further showing that older children’s suggestibility is greater for negative (sad) versus positive (happy) events.

As predicted, older children recalled significantly more correct details about the cartoon initially and after a one-week delay in response to open-ended and specific prompting. This represented the only substantiated finding from children’s recall measures. Overall, children’s recall for both age groups during the exit interview was very accurate and included few incorrect details (similar to findings reported by Bruck et al., 2007; London, Bruck, & Melnyk, 2009). Importantly, children’s recall contained a minimal number of details that were derived from false information presented in the suggestive interview and this did not differ across emotion conditions or age groups. In other words, there was no effect of suggestibility to misinformation that surfaced in children’s recall measures (i.e., false intrusions). This demonstrates the importance of proper questioning (Lamb, Hershkowitz, Orbach, & Esplin, 2008) even after children have experienced misinformation.
Against predictions, younger children were not more suggestible overall than older children for recognition measures. Conventional age decreases in suggestibility were displayed in the happy condition, but rates of suggestibility remained stable between age groups in the sad condition. Also, in opposition to hypotheses and previous research (Levine et al., 2008), 4- to 6-year-old children’s rate of suggestibility to recognition items did not differ between happy and sad discrete emotional events. Levine et al. (2008, Experiment 1) found that 4- and 6-year-olds were more suggestible to a story with a sad goal outcome than a happy goal outcome. Our study was unable to replicate this finding. One explanation for the mixed findings may arise from the differences in story complexity. In particular, Levine et al. used a story structure that was easily understood by the young children included in their study. Alternatively, the current study used a more complex cartoon narrative that was developmentally appropriate for the older children included in the study. As explained by Brainerd, Reyna, et al. (2008, p. 348), most developmental studies of suggestibility take careful consideration that materials included are understood by the youngest children and for good reason. However, in doing this, these studies unintentionally reduce sensitivity to age improvements in gist representations that foment memory errors in older children. Because a featured objective of this study was to show differences in older children’s suggestibility, we needed to use novel materials that had enough complexity to assure that older children would be suggestible and that there was enough variability in older children’s suggestibility to detect differences (i.e., no floor effects). As a result, the materials may have been too cognitively complex for the young age group to fully understand the emotional outcome and show the intended effects of emotion on their
suggestibility. Nevertheless, the story was rich in detail yet very straightforward with simple language so that it would interest the youngest children.

Another possible explanation for the mixed findings for younger children may stem from the differences in goal outcome manipulations for the two studies. In Levine et al. (2008), helping the characters in the story resulted in a tangible goal outcome of either receiving or not receiving a prize. This made it very likely that the young children included in the study understood the respective goal outcome and experienced the corresponding emotion. In contrast, the present study manipulated goal outcome through meeting an objective within the cartoon story. For the target emotion to be elicited in the present study children had to take on the goal of helping the cartoon protagonist find his lost dog. If children were unable to empathize with the plight of the cartoon protagonist they may not have experienced the target emotion. Young children in particular who are not as skilled of empathizers as older children may have had more trouble investing in the goal outcome of the cartoon, thereby not experiencing the target emotion. Therefore, younger children in the current study may not have showed differences in suggestibility between happy and sad events because the goal outcome eliciting the different emotions was not as salient. Still, another possible explanation consistent with FTT (Brainerd et al., 2010) could be that the emotional valence did not influence younger children’s suggestibility, but rather the effects of emotional valence on suggestibility increase with age. We consider this next.

**Emotional Valence and Suggestibility of Children’s Memory.** The finding that older children were more suggestible in the sad condition than the happy condition supports the hypothesis derived from FTT (Brainerd et al., 2010) instead of the affect-as-
information hypothesis (Storbeck & Clore, 2005). Brainerd and colleagues (2010) found that older children (11-year-olds) and adults had higher rates of false memory to negative emotional word lists than positive emotional word lists, while younger children (7-year-olds) showed no differences between positive and negative lists. Similarly, the current study found that 8- to 10-year-olds are more suggestible to a negative (i.e., sad) event than a positive (i.e., happy) event, whereas 4- to 6-year-olds showed no differences between the positive and negative events. In sum, these results implicate that as children age emotional valence becomes an increasingly salient cue that guides memory processes. Moreover, the results of the current study suggest that positive and negative emotional events prompt cognitive processes consistent with those proposed by FTT as opposed to the processes proposed by the affect-as-information hypothesis.

The affect-as-information hypothesis (Schwarz & Clore, 1983; 2007; Storbeck & Clore, 2005) contends that positive and negative emotional states promote different information processing strategies. In adults, systematic information processing that occurs in negative emotional states was found to reduce rates of false memory to DRM word lists relative to positive emotional states, which promote heuristic processing (Storbeck & Clore, 2005). If the results of the present study were consistent with these findings, then we would have expected that older children, who are more likely to engage in such information processing strategies, would have been more suggestible in the positive (i.e., happy) emotional state than the negative (i.e., sad) emotional state. The findings did not support this prediction, instead showing the opposite pattern. Again, the differences in findings may stem from how emotion was manipulated in the respective studies. Storbeck and Clore (2005) examined the role of a priori (i.e., incidental) mood
states on false memory for neutral word lists. Conversely, the present study investigated children’s suggestibility for an event that elicited the target emotion. Future developmental research should examine whether children’s incidental emotional states promote styles of processing consistent with the affect-as-information hypothesis. Additionally, future research needs to examine if incidental affect influences children’s memory and suggestibility for an event differently than if the event causes the emotion.

Again, the present findings support an interpretation consistent with FTT. According to FTT (Brainerd et al., 2010; Brainerd, Stein, et al., 2008), negative emotion strengthens gist memory traces and suppresses verbatim traces relative to positive emotion. These conditions make older children more vulnerable to the effects of emotional valence on false memory and suggestibility than younger children (Brainerd, Reyna, et al., 2008). Stronger gist traces and suppressed verbatim traces for the sad cartoon outcome could explain why older children were more suggestible to recognition items in the sad than the happy emotion condition. Specifically, the increased reliance on gist traces in the sad emotion condition does not support the rejection of specific false details about the cartoon for which access to verbatim traces is needed (Brainerd & Reyna, 1995). Also, as in Howe et al. (2010), the one-week delay may have made children in the sad emotional state even more reliant on gist traces.

In contrast to Brainerd et al. (2010), suggestibility did not increase with age in this study (i.e., developmental reversals in suggestibility were not found). However, this was expected since the methodology used in the current was sensitive to age improvements in verbatim memory that make older children less suggestible than younger children (Brainerd, Reyna, et al., 2008). Surprisingly, suggestibility remained stable in the sad
emotion condition from the young to old age group. Thus, the older children in the sad condition showed no evidence of age improvements in verbatim memory, suggesting that the sad emotional outcome made them vulnerable to developmental increases in gist memory which foments memory errors in older children. Children in the happy condition displayed the typical decrease in suggestibility with age, indicating that the verbatim memory advantage was not impaired by the happy emotional outcome.

Overall, the results of this study are consistent with previous research on emotional valence and false memory for emotional word lists (Brainerd et al., 2010) and can adequately be explained by FTT. However, there are some limitations to the FTT interpretation of the present results. First, as noted earlier, explaining children’s suggestibility in accordance with FTT is much more complex than explaining false memory for word lists, as suggestibility to misinformation presented in an interview concerns both endogenous (i.e., cognitive) and exogenous (i.e., social) distortion processes (Brainerd, Reyna, et al., 2008). Cognitively, older children may have been more suggestible in the sad condition not because the sad emotion increased gist processing, but because the sad emotion leads to problems with source monitoring relative to the happy condition. In this case, increased suggestibility would be the result of unspecified verbatim representations, wherein the child could remember the exact information presented from the cartoon and the interview, but fail to keep specific track of the source of that information (Brainerd & Reyna, 1995). Yet, there is no previous research to suggest that emotional valence influences children’s source monitoring.

Beyond cognitive factors, older children could have also displayed increased suggestibility to the negative emotional condition for social reasons. As in Levine et al.
older children may have been more suggestible in the sad emotion condition because the sad emotion promoted lower self-efficacy and a reliance on the interviewer’s misinformation. If this was the case, however, we would have expected younger children to show greater levels of suggestibility in the sad condition than the happy condition as well. Moreover, the design of the study made it unlikely that children were suggestible due to mere acquiescence to the interviewer without an underlying change in memory representation. Specifically, children showed no differences across emotional conditions in challenging or resisting false information in the suggestive interview. In other words, initial acquiescence rates were the same across emotion conditions within age groups. Also, the exit interview was conducted after a one-week delay by a new interviewer. Children were no longer experiencing the emotional effects of the cartoon nor the pressure to conform to the original interviewer. These considerations do not rule out the role of social influence on children’s suggestibility in this study, but make the findings unlikely without the involvement of cognitive processes and an underlying change in memory representation for the event.

A second limitation of the FTT interpretation is that the findings of suggestibility were limited to recognition measures. As argued by Howe and colleagues (2010), if negative valence increases gist processing then one should see an increase in suggestibility for both recall and recognition measures in the sad condition. However, in this study children had limited opportunity to include suggested misinformation into their recall narratives. Children were only presented with six pieces of false information regarding very specific details of the cartoon. This makes the recognition items a more sensitive measure of children’s suggestibility. Finally, a goal of this study was to
examine if the valence effects on false memory were limited to specific discrete emotions. The concerns with the angry condition manipulation did not allow for an effective evaluation of this question. Preliminary evidence gathered in this study would suggest that anger has similar effects on children’s suggestibility as happiness as opposed to the similarly valenced emotion of sadness. In turn, the FTT interpretation may only apply to the comparison of specific discrete emotions as opposed to valence states generally. This remains to be soundly examined by future research.

**Limitations and Directions for Future Research.** The strength of the present experimental study was the control over extraneous variables allowing for the isolation of variables of interest. Some past studies examined memory for events with different emotions, but the entire events or stories differed so that any memory differences might be driven by the different content. In the present study, the event the child experienced (a cartoon) was the exact same across emotion conditions, except for the ending designed to elicit the target emotion. Additionally, the recognition questions asked were controlled so the same true and false details were equally represented as reminders and non-reminders across emotion conditions and age groups. Thus, the findings can be attributed to the randomly assigned goal outcome of the cartoon and the age group of children.

However, the maximization of control in this study comes at a cost. One limitation of the present study is the generalizability to events of forensic interest. Due to ethical concerns, the cartoon the child watched was relatively benign compared to events children are asked to testify on in court. The child participants included in the study showed little outward signs of negative emotion, and careful consideration was taken to make sure the experience was enjoyable otherwise. As a result, children’s levels of
emotional arousal were low and not at levels comparable to forensic events of interest. One possibility is that discrete emotional events could have differing effects on children’s suggestibility depending the amount of emotional arousal present (Deffenbacher, Bornstein, Penrod, & McGorty, 2004). Also, the present study investigated children’s suggestibility for sad and angry negative emotional events as opposed to threat or fear centered reactions that are often attributed to events of forensic interest. Thus, future research should examine if fear shows similar effects on children’s suggestibility as sadness. Finally, memory for watching an interactive cartoon may not be the same as memory for an emotional event the child personally experienced. Even though both types of memory may be characterized as autobiographical, children will have more investment in a personal event and goal outcomes associated with that event. Future research should examine the effect of children’s emotional appraisals and discrete emotions on suggestibility of memory in naturalistic contexts. For example, examining children’s suggestibility for swimming lessons (Price & Connolly, 2007) or winning or losing a soccer match (Baker-Ward, Eaton, & Banks, 2005) provide a unique platform in which children’s emotional appraisals of the events naturally vary, but the event remains relatively constant. In addition, examining children’s emotional appraisals for negative emotional events (e.g., medical procedures) may help to explain some of the differences in studies examining emotional arousal and suggestibility.

A second limitation of the present study was that no measurements of children’s emotional reaction or emotional appraisals to the cartoon were included. Consequently, some children may not have experienced the target emotion associated with a particular goal outcome. However, using a similar methodology, Levine et al. (2008, Experiment
1) found the same results in analyzing children by emotion condition and by observer-rated emotion. Along with this limitation, there were concerns with the angry emotional manipulation as children had difficulty understanding the goal outcome in the angry condition. This necessitated dropping the angry condition from the primary analyses. Future research should strive to include measures of children’s emotional appraisals in addition to conventional measures of emotion and emotional arousal (e.g., parental reports, physiological measures). Additionally, future research should attempt to integrate children’s discrete emotions with measures of emotional arousal to fully understand the dynamics of emotion on children’s memory and suggestibility. Lastly, more research needs to be conducted comparing the effects of different discrete negative emotions (e.g., sadness, anger, fear) on children’s memory and suggestibility.

Conclusions. In conclusion, this research shows that emotional valence and discrete emotions of an event have specific implications for the suggestibility of children’s memory for the event across age. The findings of this study make both theoretical and practical contributions. From a theoretical perspective, the results of the current study show the importance of considering emotional factors beyond emotional arousal when examining children’s memory and suggestibility. Also, the present findings provide support for the FTT account of emotional valence and memory. Experiencing a negative (sad) emotional event played an increasingly important role in children’s suggestibility with age. Children 8- to 10-years-old were more suggestible to the sad than the happy story outcome, implicating older children’s increased reliance on gist memory traces in memory for a sad emotional event. From an applied perspective, this study provides preliminary evidence on how emotional valence and discrete emotions
may influence children’s testimony. A common misconception is that younger children are always more suggestible than older children. The findings of this study implicate that in an emotional context about which children may testify, a sad emotional event, 8- to 10-year-olds are just as vulnerable to leading questions as 4- to 6-year-olds. Consequently, the use of ill-advised leading questioning after a child experiences a sad event does not only compromise young children’s testimony, but older children’s as well.
References


Pezdek, K., & Lam, S. (2007). What research paradigms have cognitive psychologists used to study “false memory,” and what are the implications of these choices? *Consciousness and Cognition, 16*, 2-17.


Appendix A

Story Script

Scene 1: Walk in the Park

(Intro music)

Owen: Hi there friends. My name is Owen and this is my dog Scooter. Scooter and I were just about to take a walk in the park, would you like to join us?

(A brief pause to allow children to answer)

Owen: Come along! (Start walking into the park) Scooter really likes the park in the summer, when he can meet other dogs and people and the sun is shining. (Scooter smells a flower).

(During the walk a rabbit runs out from behind a bush, Scooter starts chasing it and Owen is hanging on to the leash)

Owen: Scooter, slow down! Whoa! (Owen is running to keep up with Scooter)

(After a brief episode of running around, the rabbit gets away and Scooter slows down by a park bench. Owen is huffing and puffing)

Owen: Scooter, let me catch my breath. (Owen sits down on the park bench with Scooter sitting below him)

(While sitting on the bench, Owen’s friend Kayla starts walking into the scene).

Owen: Hey everybody, here comes my friend Kayla. Hi Kayla!

Kayla: Hi Owen. What are you doing at the park today?

Owen: My friends and I are taking Scooter for a walk.

Kayla: Oh yes, Scooter. How are you Scooter? (Kayla pets Scooter; Scooter barks) and your friends?

Owen: Oh yes. Let me introduce you. Friends this is Kayla. (Scooter starts to walk off)

Kayla: Why hello. It’s a pleasure to meet you. Owen, why are you sweating?

Owen: (Stating in a macho tone) Well, I was just taking Scooter for a run. He was having trouble keeping up.

Kayla: (Looking at the audience) Is that really what happened? (A brief pause to allow the child to answer; meanwhile Scooter has started to chase a butterfly)
Owen: No, Scooter was actually chasing a rabbit. (Scooter disappears off the screen)
Weren’t you Scooter? Scooter? Where did Scooter go? On no, I lost him. Kayla, do you know where he is?

Kayla: No, I wasn’t paying attention to him. Perhaps our friends know.

Owen: (Looking at the audience) Did you see which way Scooter went? (Brief pause to allow child to respond) This way you said? (Walking towards the direction Scooter went). Kayla, will you help me look for Scooter?

Kayla: Of course

Owen: (Looking at the audience) Will you help me find my lost dog? I need your help. (Brief pause to let child respond) Thank you. Scooter went this way you said? (pointing and starting to walk in the direction) Let’s go!

**Scene 2: Search at the park.**

(Owen and Kayla are walking down the path.)

Kayla: Where do you think Scooter is?

Owen: Maybe we should look at some of his favorite places in the park.

Kayla: That’s a great idea.

Owen: Scooter really likes playing with kids. Maybe he went by the playground. Let’s go see!

(Kayla and Owen approach the playground.)

Owen: I do not see Scooter anywhere.

Kayla: I don’t see him either. Do you? (Looking at the audience) Maybe we should ask the old man sitting at the park bench.

Owen: Good idea. (Walks up to the person) Excuse me sir, did you see a dog go by here?

Man: Why actually I did. He was playing with children on the playground. He followed them when they left. I thought it was their dog.

Kayla: Did you see which way they went?

Man: Why they ran off that way (pointing in direction)

Owen: Thank you sir for your help.
Kayla: Yes, thank you.

Man: Your welcome.

Owen: Let’s hurry!

(Owen and Kayla run off in the direction the man pointed)

(Owen and Kayla come to a fork in the road; from the side paw prints enter the picture and follow one of the paths)

Owen: Which way should we go?

Kayla: Look here! (pointing to the paw prints) Maybe we should follow them. Which way do you think we should go? (Looking at the audience; give them time to respond)

Owen: Great advice. Thank you for your help. (Looking at audience) Let’s follow these paw prints.

(Paw prints lead to behind a tree)

Kayla: Maybe Scooter is just behind that tree.

(Kayla and Owen run to look behind the tree; they see a big dog with its owner; In a low tone the dog woofs)

Dog Owner: Hi there. This is Sydney and I’m Amanda.

Owen: Pleased to meet you both. I am looking for my dog. Did you see another dog around?

Dog Owner: Why yes I did. The dog went that way out of the park (pointing to the exit of the park).

Kayla: Thanks for your help. Come on everyone lets continue our search! (Start to walk towards the exit of the park)

Scene 3: Visit to the ice cream shop.

(Owen and Kayla exit the park onto the sidewalk of the town)

Kayla: Where do we look now?

Owen: I have got an idea. It’s a hot summer day, what do you like to do in town on a hot summer day?
Kayla: I dunno. What?

Owen: Eat ice cream at The Ice Cream Shoppe.

Kayla: Owen, Scooter is a dog. He doesn’t eat ice cream.

Owen: Not true. Scooter comes with me all the time to get ice cream and sometimes I give him some.

Kayla: Well, I guess it’s worth a try.

Owen: All right, let’s go see.

(On the way to the Ice Cream Shoppe Kayla and Owen hear a distant bark; and a distant voice shouting)

Ice cream proprietor: Get out! No dogs allowed.

Kayla: Hurry! That could be Scooter.

(Kayla and Owen approach the Ice Cream Shoppe huffing and puffing; Scooter is not in sight; They enter store to talk to proprietor)

Owen: Good day sir. Did you see a dog come by here?

Ice cream proprietor: (In disgruntled tone) Yes, he was trying to come into my store. Is that dog yours?

Owen: (Answering reluctantly) Yes. Did you…

Ice cream proprietor: (Cutting Owen off, still angry) You need to be more responsible. Clearly no dogs are allowed.

Owen: I am sorry sir. I lost him earlier and have been searching for him and could use your help. Do you know which way he went?

Ice cream proprietor: (In an apologetic tone) Sorry I did not know. I think he went that way (pointing in direction). Good luck finding him.

Owen: Thank you sir. Let’s go

(Owen and Kayla exit the store)

Kayla: Now which way did the man say he went?
Owen: I don’t remember. Do you remember which way to go? (Pause to give child chance to respond) … That’s right. Great job paying attention!

Kayla: Where do we look now?

Owen: Well my house is this way. Maybe Scooter found his way home.

Kayla: Lets go see. (Kayla and Owen start walking)

**Scene 4: Search at Owen’s home**

(Kayla and Owen approach the home; Scooter is not in the yard)

Kayla: Owen, I don’t see him.

Owen: Let’s check the backyard. (Walk to backyard) He’s not here either. (In a sad tone) I lost my dog. What do we do? We’ve looked all over and cannot find him.

Kayla: Let’s go inside and think of a plan. Cheer up we will find Scooter. (Kayla and Owen enter the house)

Owen: I do not know where else to look.

Kayla: I’ve got a plan.

Owen: What’s that?

Kayla: Why don’t we make a flyer and hang it up all over town? We can put a picture of Scooter on it and include your phone number and address.

Owen: That is a great idea. Maybe we will find Scooter after all. Let’s start making the flyer.

(A quick sequence of the two working with frantic music playing)

Kayla: There, it’s done.

(Show close up of the flyer)

Owen: (Looking at the audience) What do you think? (Pause) Let’s make copies and post them all over town.

**Scene 5: Putting up flyers around town... a lead.**

(Owen and Kayla are putting up flyers around town. Owen is putting a flyer on a light post while a stranger is looking on; Owen starts to walk away)
Old Woman: Young man I think I can help you.

Owen: Really?

Old Woman: Yes, I saw a dog like that one peering into the window at the pet store a little while ago.

Owen: Thanks. (Shouting) Kayla, to the pet store!

(Arrive at the pet store, Scooter is not there. There is a construction worker nearby working on repairing the sidewalk. There is an area of wet cement with paw prints leading from it)

Owen: (In a sad tone) He’s not here.

Kayla: (Seeing the construction worker) Maybe he saw Scooter.

Owen: Excuse me sir, have you seen this dog (showing a flyer).

Construction Worker: Oh yes. Because of him I have to fix this area of sidewalk. He stepped in the wet cement.

Owen: Sorry. Did you see which way he went?

Construction Worker: I did not.

Kayla: Which way should we look? Do you know? (looking at the audience, pause to let them answer) That’s right, we can follow the paw prints. Thanks for your help again.

Owen: Quick, they go this way.

(Owen and Kayla follow the paw prints, they start getting fainter as they lead back to the park; The paw prints stop at the park entrance)

Owen: The prints stop at the park. The cement must have dried. Now what?

Kayla: I guess we go back into the park.

**Scene 6: Emotional Manipulation... Alternate Endings**

(Owen and Kayla enter the park)

Kayla: Now where do we look? We are running out of time.
Owen: I know, let me think. Mhhmm… I’ve got it! Scooter and I sometimes play hide and seek by the pond. Maybe he thought I was hiding on him and he went to find me.

Kayla: Quickly, let’s go to the pond.

(Owen and Kayla approach the pond on one side; there are a few trees scattered about and other possible hiding places)

Owen: I don’t see him here. (As he is looking behind a tree)

Kayla: Just ducks here. (Kayla says as she sees a mother duck and a few chicks walking in a straight file line).

Owen: It doesn’t look like he is anywhere on this side of the pond.

Kayla: Should we check the other side of the pond?

Owen: Yes, but we better run we are almost out of time.

(Owen and Kayla start running towards the other end of the pond. The screen cuts-away to the area Owen and Kayla are running towards; here the audience sees Scooter. Scooter sees them coming and hides behind a rock.)

(Owen and Kayla arrive at the other side of the pond)

Owen: I don’t see him here either. Do you Kayla?

Kayla: No (in a sad tone). (Looking at audience) Friends did you see Scooter? (Brief pause to allow child to answer) You did. Where? (Brief pause to allow the child to answer) Behind that rock (pointing to the rock the children saw Scooter hide behind).

Owen: You are such a great help! (says while looking at the audience) We are going to find Scooter!

(Kayla and Owen start to approach the rock and start to peer behind when…)

Ending to elicit happiness:

(Owen and Kayla peer around the rock to find Scooter there hiding; Scooter barks as he sees Owen; happy musical tones are playing)

Owen: Scooter! (Owen says as he embraces Scooter)

Kayla: We found him! Thank you so much for your help we never could have found him without you. (Looking and smiling at the audience)
Owen: Yes, thank you. You were so helpful. Scooter, how ‘bout we go home? Thanks again friends Owen says waving good-bye. Thanks for your help Kayla, too. Good bye.

Kayla: Good bye Owen. Thanks again for your help friends. (Kayla says looking at the audience as Owen starts walking away, starts waving) Good bye. (Kayla walks off, happy music is playing; screen fades out)

*Ending to elicit sadness:*

(Owen and Kayla peer around the rock to find nothing there; sad musical tones play)

Owen: He’s not there. Scooter…Scooter! (Owen cries to see if he is around)

Kayla: I thought he would be here. Where is he?

Owen: I lost my dog! (Owen says with a somber expression and looks as if he is about to cry) The search is over, we’ve looked everywhere.

Kayla: (Also has sad expression, looks at audience). I really thought we could have found him with your help. I better go try to cheer up Owen.

Owen: Why couldn’t we find him? Why?

Kayla: Bye friends. (Kayla says with sad expression and goes to catch up with Owen; sad music is playing; the screen fades out)

*Ending to Elicit Anger:*

(As Kayla begins to ask children if they saw Scooter, the story stops and the words “Out of Time” appear on the screen.)
## Appendix B

### True and False Items Given During the Suggestive Interview Involving the Cartoon

<table>
<thead>
<tr>
<th>Scene 1: Walk in the Park</th>
<th>False Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scooter was walking ahead of Owen</td>
<td>Owen had Scooter on a leash</td>
</tr>
<tr>
<td>Scooter chased a bunny rabbit</td>
<td>Scooter chased a cat</td>
</tr>
<tr>
<td>Scooter got lost following a butterfly</td>
<td>Scooter got lost playing with a beach ball</td>
</tr>
<tr>
<td>Owen was talking with his friend Kayla when Scooter got lost.</td>
<td>Owen was playing catch with his friend Kayla when Scooter got lost.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scene 2: Search at the Park</th>
<th>False Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owen and Kayla look for Scooter at the playground</td>
<td>Owen and Kayla look for Scooter at the sandbox</td>
</tr>
<tr>
<td>Owen and Kayla asked a man if he saw Scooter</td>
<td>Owen and Kayla asked a child if they saw Scooter</td>
</tr>
<tr>
<td>Owen and Kayla followed paw prints</td>
<td>Owen and Kayla followed children playing.</td>
</tr>
<tr>
<td>Owen and Kayla met a big gray dog.</td>
<td>Owen and Kayla met a small black dog.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scene 3: Visit to the Ice Cream Shop</th>
<th>False Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ice cream store worker told Owen that “No Dogs were allowed” in the ice cream store.</td>
<td>Dogs were allowed in the ice cream shop.</td>
</tr>
<tr>
<td>The ice cream store worker was wearing a hat.</td>
<td>The ice cream store worker was wearing an apron.</td>
</tr>
<tr>
<td>The ice cream store worker pointed which way Scooter went.</td>
<td>Owen got an ice cream cone.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scene 4: Search at Owen’s Home</th>
<th>False Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owen’s house was blue.</td>
<td>Owen’s house was white.</td>
</tr>
<tr>
<td>Owen searched the backyard at his house.</td>
<td>Owen searched at his neighbor’s house for Scooter.</td>
</tr>
<tr>
<td>Owen and Kayla made a flyer to help find Scooter.</td>
<td>Owen and Kayla called neighbors on the phone to help find Scooter.</td>
</tr>
<tr>
<td>The flyer had a picture of Scooter on it.</td>
<td>The flyer was printed on bright yellow paper.</td>
</tr>
<tr>
<td>True Items</td>
<td>False Items</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td><strong>Scene 5: Putting up Flyers Around Town…A Lead</strong></td>
<td></td>
</tr>
<tr>
<td>A woman says she saw Scooter outside the pet store.</td>
<td>A woman says she saw Scooter outside a restaurant.</td>
</tr>
<tr>
<td>The construction worker was wearing a bright orange vest.</td>
<td>The construction worker was wearing a yellow hard hat.</td>
</tr>
<tr>
<td>Scooter stepped in wet cement creating a trail of paw prints.</td>
<td>Scooter stepped in a mud puddle creating a trail of paw prints.</td>
</tr>
<tr>
<td>The paw prints led Owen and Kayla back to the park entrance.</td>
<td>The paw prints led Owen and Kayla back to Owen’s house.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Scene 6: Alternate Endings</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Owen and Kayla search by the pond, where Owen and Scooter sometimes play hide and seek.</td>
<td>Owen and Kayla search by the jungle gym, where Owen and Scooter sometimes play tag.</td>
</tr>
<tr>
<td>While searching for Scooter, Kayla spots some ducks.</td>
<td>While searching for Scooter, Kayla spots a squirrel.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th><strong>Scene 6: Happy Ending</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Owen and Kayla found Scooter behind the rock.</td>
<td>Owen and Kayla did not find Scooter behind the rock.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Scene 6: Sad Ending</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Owen and Kayla did not find Scooter behind the rock.</td>
<td>Owen and Kayla found Scooter behind the rock.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Scene 6: Angry Ending</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Owen and Kayla ran out of time before they could look behind the rock.</td>
<td>Owen and Kayla found Scooter behind the rock.</td>
</tr>
</tbody>
</table>
Appendix C

Example Suggestive Interview Protocol

[To be given directly after the cartoon story by a second researcher]

Hi (child’s name). My name is (your name). I was just talking with (other researcher’s name) and he/she told me that you watched a cartoon story with my friend Owen. Is that right? Now (child’s name) I want to hear what you can remember about the cartoon with our friend Owen. I am going to use this (referring to the audio recorder) to record everything you say about the story. [Begin audio recording.]

I wasn’t in the room, so I don’t know what happened in the story. [Proceed to first open-ended question].

Interview Format:

1.) Open Ended Questions:

(Child’s Name) Can you tell me everything that happened in the cartoon story? Start with the first thing that happened and tell me everything you can, even things you don’t think are very important. But don’t guess or make anything up – just tell me what you saw or heard or did during the cartoon.

If the child says he or she does not know or does not remember encourage them by saying...

-Think real hard, can you tell me everything that happened in the story?

Allow the child to tell as much as he or she can to this one prompt. If the child stops responding, follow-up with these types of questions:

-What else happened?

-Can you tell me more?

-Anything else?

Also, if the child is giving some vague details about a general part of the story and you think they can tell you a little more, you can ask questions such as these:

-Can you tell me more about that part of the story?

-What else happened in the beginning?
The free narrative will be considered complete when the child stops talking and remains silent for a minimum of fifteen seconds and/or states that he or she cannot remember anything else.

2.) Specific / Prompted Questions:

Now I am going to ask you some more questions about the cartoon, o.k. If you don’t know or can’t remember the answer, please let me know, all right. (The other researcher’s name) told me some things that happened in the story with Owen, but I would like to know more.

a. Can you tell me what happened while Owen was walking his dog Scooter in the park?

b. Can you tell me more about what happened when Scooter got lost?

c. Can you tell me about all the places that Owen and his friend Kayla searched for Scooter? [You may also need to prompt children by saying, “Were there any other places?”]

d. Can you tell me about anything else that Owen and Kayla did to help them find Scooter?

e. What happened at the end of the cartoon?

3.) Direct Questions:

When asking the child the following questions, if the child says that an event did not happen, tell them, “Just say something,” “just take a guess,” or “I need to write something down. Just pick one,” and repeat the question. If child corrects you say, “I need you to answer my question” and repeat question and choices. If the child still doesn’t agree, say, “I just need to write it down – Owen had Scooter on a red leash while walking in the park.” Don’t let the child ramble!

Now I just have a few more questions about things that (the other researcher’s name) said happened in the story. I just want to make sure I understand everything that happened.

Scene 1: Walk in the Park

First, I want to ask you some questions about the beginning of the story, when Owen was taking Scooter for a walk in the park.

1t.) While walking in the park, I heard that Scooter was walking ahead of Owen.
Was Scooter close or far away from Owen?
   Corrects  DK/DR  Other
   Resists
1)
2)
3)
Oh, good answer, so Scooter was walking ahead of Owen and Scooter was (close to / far away from) Owen.

2f.) I heard that while taking a walk in the park Scooter chased a cat.
   Was the cat black or orange?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
Oh, good answer, so Scooter chased a (black / orange) cat while taking a walk in the park.

Scene 2: Search at the Park

Next, I want to ask you some questions about Kayla and Owen searching for Scooter at the park right after they lost him.

1t.) While searching at the park, I heard that Owen and Kayla followed paw prints.
   Were the paw prints big or small?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
Oh, good answer, so Owen and Kayla followed (big / small) paw prints.

2f.) While searching at the park, I heard that Owen and Kayla met a small black dog?
   Was the dog’s owner a man or a woman?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
Oh, good answer, so Owen and Kayla met a small black dog whose owner was a (man / woman).

Scene 3: Visit to the Ice Cream Shop

Next, I want to ask you some questions about when Kayla and Owen left the park to search for Scooter.
1f.) After leaving the park, I heard that Owen and Kayla first looked for Scooter at a lemonade stand.
   Was the lemonade stand far away from or close to the park?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so after leaving the park, Owen and Kayla looked for Scooter at a lemonade stand and the lemonade stand was (far away from / close to) the park.

2t.) I heard that the ice cream store worker told Owen that “no dogs were allowed” in the ice cream store.
   Was the ice cream store worker tall or short?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so the (tall / short) ice cream store worker told Owen that “no dogs were allowed” in the ice cream store.

Scene 4: Search at Owen’s Home

And now I want to ask you some questions about when Owen and Kayla went to Owen’s house to search for Scooter.

1f.) I heard that Owen and Kayla called neighbors on the phone to help find Scooter
   Did Kayla or Owen suggest calling the neighbors?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so Owen and Kayla called neighbors on the phone to help find Scooter and (Owen / Kayla) suggested calling the neighbors.

2t.) I heard that the flyer that Owen and Kayla made had a picture of Scooter on it.
   Was the picture of Scooter in color or was it in black and white?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so the flyer that Owen and Kayla made had a (color / black and white) picture of Scooter on it.
Scene 5: Putting up Flyers Around Town…A Lead

And next I would like to ask you some questions about when Owen and Kayla were putting up the lost dog posters and finding clues about where Scooter was.

1t.) I heard that a woman told Owen that she saw Scooter outside a pet store.
   Was the woman old or young?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so a (old / young) woman told Owen that she saw Scooter outside a pet store.

2f.) I heard that Owen and Kayla met a construction worker that was wearing a yellow hardhat.
   Was the construction worker tall or short?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so the (tall / short) construction worker was wearing a yellow hardhat.

Scene 6: Alternate Endings

Now I am going to ask you some questions about the end of the cartoon, when Owen and Kayla went back into the park to try and find Scooter.

1t.) I heard that in the park Owen and Kayla searched by the pond, where Owen and Kayla sometimes play hide-and-seek.
   Was the pond large or small?
   Corrects  DK/DR  Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so in the park Owen and Kayla searched by the (large / small) pond, where Owen and Scooter sometimes play hide-and-seek.
Researcher administering story marks the child’s corresponding emotional condition with an X.

[ ] Happy Ending:

2f.) I heard at the end of the story that Owen and Kayla did not find Scooter behind the rock.
   Was the rock large or small?
   Corrects     DK/DR     Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so Owen and Kayla did not find Scooter behind the (large / small) rock.

[ ] Sad Ending:

2f.) I heard that at the end of the story Owen and Kayla found Scooter behind the rock.
   Was the rock large or small?
   Corrects     DK/DR     Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so Owen and Kayla found Scooter behind the (large / small) rock.

[ ] Angry Ending:

2f.) I heard that at the end of the story Owen and Kayla found Scooter behind the rock.
   Was the rock large or small?
   Corrects     DK/DR     Other
   Resists
   1)
   2)
   3)
   Oh, good answer, so Owen and Kayla found Scooter behind the (large / small) rock.

**Repeat each reminder. If child corrects you, say “But you said that…”**
E.g., “You told me that Owen had Scooter on a leash,”
   “And you said that Scooter chased a bunny rabbit.”

Thank the child and tell them what a big help they were!!