A systematic review of the reliability of children's event reports after discussing experiences with a naïve, knowledgeable, or misled parent[☆]

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ABSTRACT

Child maltreatment allegations often initially arise during informal conversations between children and a non-offending parent. Whether and how initial parent-child discussions influence the reliability of children's subsequent forensic reports are critical contemporary questions regarding child witness testimony. In the current paper, we systematically reviewed the extant empirical literature regarding the effects of parent-child discussions on the accuracy of children's subsequent event reports. PsycINFO, PubMed, and Web of Science databases were searched for English-language, peer-reviewed papers that examined children's (defined as participants 17-years-old or younger) reports after they discussed a target event with a parent. The systematic search yielded 23 eligible studies. To facilitate interpretation of the reviewed findings within the autobiographical memory and child witness literatures, our review is organized according to whether parents were naïve, knowledgeable, or misled prior to conversing with their children. We also report whether the studies demonstrated facilitative, misinformation, or non-significant effects of the parent-child discussion on the accuracy of children's reports during a subsequent memory interview with a researcher. Consistent with the broader child memory literature, facilitative effects were often found among studies where children discussed the target event with a knowledgeable parent. In addition, misinformation effects were frequently observed among studies with misled parents. Limitations of the current studies, including generalizability of the observations to experiences on which children testify, and recommendations for future research and for forensic professionals are discussed.

Discussions about past experiences have important mnemonic consequences for children's autobiographical memory and forensic reports. Event-related discussions may facilitate children's memory by providing opportunities for rehearsing event details and by fostering connections between events and the self (Fivush, 2011; Fivush, Haden, & Reese, 2006; Nelson & Fivush, 2004; Pipe, Sutherland, Webster, Jones, & La Rooy, 2004). Alternatively, event-related discussions may hinder the accuracy of children's memory by exposing children to erroneous event details (Bruck & Melnyk, 2004; Ceci & Bruck, 1993, 2006; London, Bruck, & Melnyk, 2009; Principe & Schindewolf, 2012). The extent to which conversations between children and an unfamiliar researcher bolster or impede the reliability of children's memory as it applies to forensic contexts has been a central focus of much of the extant child witness

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research. However, in the vast majority of child maltreatment cases that come to the attention of authorities, children make initial outcries to someone in their everyday lives, such as a non-offending parent (Hershkowitz, Lanes, & Lamb, 2007; London, Bruck, Ceci, & Shuman, 2005; Malloy, Brubacher, & Lamb, 2013). That is, children involved in child maltreatment investigations typically have talked to a parent about the events in question prior to being forensically interviewed. Elucidating whether and under what circumstances parent-child discussions (as opposed to conversations with an unfamiliar adult) influence the reliability of children's subsequent reports are critical contemporary questions regarding child witness memory.

The accuracy of children's disclosures to their parent(s) is undeniably important because official reports are often made on the basis of these initial accusations. Parents may provide information to the investigation team regarding their children's disclosures, which establishes a foundation for questioning children during the forensic interview (Rivard & Compo, 2017). In addition, hearsay exceptions generally allow parents to testify about their children's initial statements (Lyon & Stolzenberg, 2014; Meyers, 2011). Notwithstanding, once the formal investigation is initiated, identifying whether earlier allegation-relevant conversations between child witnesses and their parents may have influenced children's formal forensic reports are central concerns (Ceci & Bruck, 1993; Goodman, Jones, & McLeod, 2017; Goodman, Quas, Bulkley, & Shapiro, 1999; Newlin et al., 2015; O'Donohue, Benuto, & Cirlugea, 2013; Powell & Lancaster, 2003). The current paper provides a systematic review of the extant empirical literature examining the objective accuracy of children's event reports after children discussed the target experience with a parent. From this systematic review, the breadth of the existing literature, its limitations, and patterns among the data are identified. Recommendations for future research and for forensic professionals are provided.

The following systematic review is organized according to whether parents were naïve (i.e., lacked knowledge about the target event), knowledgeable (i.e., observed the event or had correct information regarding the event), or misled (i.e., had incorrect information about the event) prior to conversing with their children. Whether interviewers have *a priori* beliefs regarding the events in question has an enduring impact on children's concurrent and subsequent reports (for reviews see Ceci & Bruck, 1993, 2006; Rohrabaugh, London, & Hall, 2016). The term *interviewer bias* describes situations in which interviews are conducted in a manner to elicit reports that are consistent with the interviewers' preconceptions of the interviewees' experience. Biased interviewers engage in a confirmatory bias strategy in which details that confirm their preexisting beliefs are emphasized and contradictory information is negated (Kassin, Dror, & Kukucka, 2013). Biased interviewers frequently employ leading questioning techniques, including positive and negative reinforcement and repeating questions when previous responses did not affirm the interviewers' theories (Ceci & Bruck, 2006; Rohrabaugh et al., 2016). Children often provide reports that coincide with the interviewers' pre-established beliefs (Thompson, Clarke-Stewart, & Lepore, 1997). When questioned by erroneously biased interviewers, misinformation effects have been observed during subsequent unbiased interviews (London et al., 2009; Melnyk & Bruck, 2004; Thompson et al., 1997). On the basis of this research, investigators are recommended to test alternative hypotheses regarding parental biases and whether initial parental questioning may have influenced children's subsequent forensic reports (Newlin et al., 2015; O'Donohue et al., 2013; Powell & Lancaster, 2003). Demonstrating the potential for contamination resulting from parental inquiry is a core component of the defense strategy in cases involving maltreatment allegations and can also be pertinent in divorce and child custody cases (Goodman et al., 1999; Powell & Lancaster, 2003).

An implicit assumption in the forensic developmental literature is that children's reports are similarly influenced by biased interviewers regardless of their status as a parent or an unfamiliar adult. Preliminary empirical evidence, however, suggests that the relationship status of the interviewer may differentially impact children's *interrogative suggestibility* (i.e., how readily children acquiesce to misleading questions or agree with misinformation during a particular conversation; Bruck & Melnyk, 2004; Goodman, Sharma, Thomas, & Considine, 1995; Jackson & Crockenberg, 1998). Children may be less inclined to agree with misleading questions posed by a biased parent than a biased stranger given the familiarity of the parent-child relationship and the frequency in which parents and children likely discuss conflicting opinions during daily discourse (Goodman et al., 1995; Jackson & Crockenberg, 1998). However, once an official investigation is initiated, whether initial discussions with a misled parent could have influenced the accuracy of children's subsequent event reports via *misinformation effects* and *source misattribution errors* are paramount questions for forensic professionals.

In the context of parent-child discussions, *misinformation effects* may occur when parents introduce false information during the conversation and children later report such erroneous details when subsequently recalling the event. *Source misattribution errors* may occur when children are unable to explicitly differentiate whether erroneous information suggested by a parent actually happened or was only introduced by their parent during conversation (Bruck & Melnyk, 2004; Ceci & Bruck, 1993; Johnson, Hashtroudi, & Lindsay, 1993). A large child suggestibility literature demonstrates that misinformation effects and source misattribution errors are more or less likely to occur depending on various circumstances, such as the child's age and the timing of the post-event information in reference to the target event and the formal interview (Ceci & Bruck, 1993, 2006 for reviews). For example, source monitoring abilities improve across the preschool years (Johnson et al., 1993), indicating that younger children may be especially vulnerable to commit source misattribution errors. In addition, misinformation effects are more likely to occur after the passage of time and memory for the target event weakens (Loftus, 2005; London et al., 2009). Therefore, in the following review, design elements such as child participant age and delay from the event to the parent-child discussion and from the discussion to the interview are emphasized.

Just as exposing children to false post-event information may distort their reports, true post-event information has been shown to bolster children's recall (London et al., 2009; Melnyk & Bruck, 2004). In that vein, parent-child discussions may have a *facilitative effect* on children's subsequent memory. Sociocultural theories of autobiographical memory development suggest that parent-child discussions of past experiences are critical in aiding children's memory consolidation and for fostering children's ability to communicate about past events through narratives (Fivush, 2011; Fivush et al., 2006; Nelson & Fivush, 2004). In addition, when considering children's memory for traumatic experiences, such as child abuse and neglect, discussions with a parent may be especially

important for children's understanding of their adverse experiences and their ability to discuss the event with others in a coherent manner (Salmon & Reese, 2015). Parent-child discussions occurring long after the event, but soon before the subsequent interview may be especially important in promoting children's long-term memory (Pipe et al., 2004; Roberts, Lamb, & Sternberg, 1999).

In the remainder of the article, we systematically review the empirical literature regarding the objective accuracy of children's event reports after they discussed the experience with a parent. Data are reported according to whether each study revealed mis-information (including source misattribution errors), facilitative, or non-significant effects of the parent-child discussion on children's reports during a subsequent memory interview with a researcher. Each study is additionally conceptualized within the broader parental bias framework (naïve, knowledgeable, or misled) based on the type of information parents had prior to conversing with their children. Because this is the first comprehensive review of this literature, an initial goal of the current review is to provide a compilation of the extant research. The second and primary goal of the review is to identify existing patterns of observations across studies where parents were naïve, knowledgeable, or mislead prior to discussing the target event with their children.

Method

Summary of search strategy

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a protocol for screening the literature for relevant studies was established prior to beginning the search process (Shamseer et al., 2015). PsycINFO, PubMed, and Web of Science databases were thoroughly searched for papers that met the following a priori inclusion criteria: (1) child participants were 17-years-old or younger, (2) children participated in an objectively verifiable event (referred to as the target event in the remainder of the review), (3) children later discussed the target event with a parent (i.e., the parent-child discussion) and researchers have some record of these conversations, and (4) children participated in a memory interview conducted by a researcher after the parent-child discussion (i.e., the memory interview). In addition, articles had to be available in English. Only published manuscripts were included because they have undergone the rigor of peer-review. Restrictions regarding the date of publication were not applied.

Keywords employed included: ("child" OR "child witness") AND ("testimony" OR "autobiographical memory" OR "memory") AND ("parent" OR "mother"). An additional search was conducted within each database with ("suggestibility" OR "misinformation") added to the previous string of keywords. Studies referenced in relevant publications were also examined to identify eligible papers. The last search was conducted in January 2018. Titles, abstracts, and full-texts were screened for eligibility. Fig. 1 summarizes the results of the database search.

Data extraction and quality assessment

Retained studies were thoroughly inspected to extract relevant data and to conduct a quality assessment. The National Heart, Lung, and Blood Institute's *Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies* (NHLBI, 2014) was used to
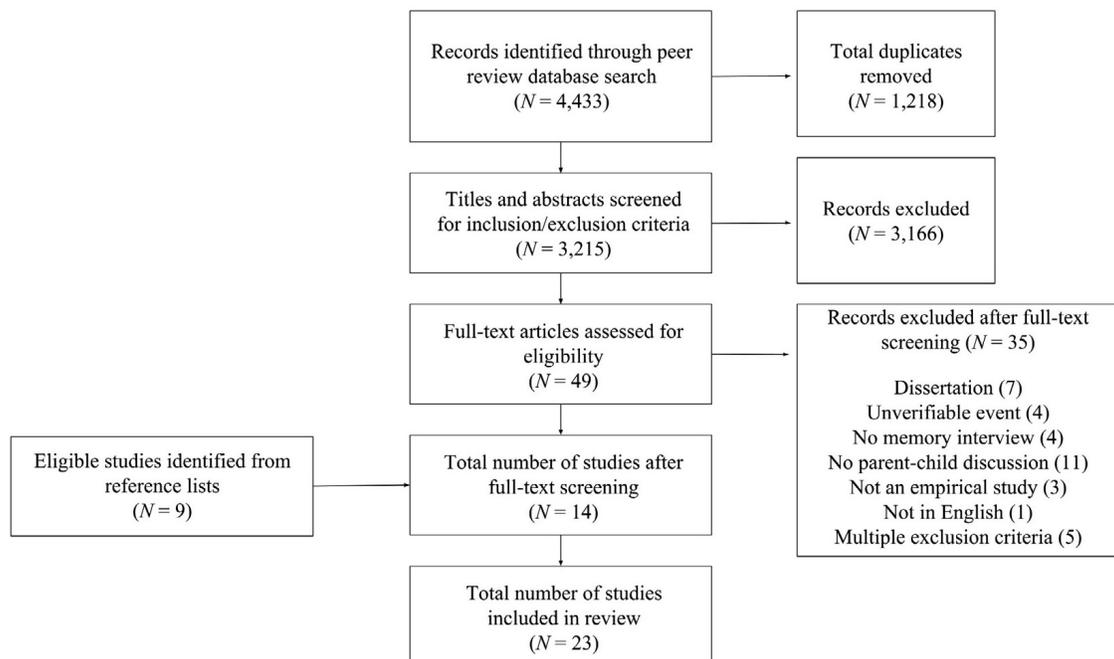
Fig. 1. Summary of database search.

assess the risk for bias for each study. The studies were individually scored in a presence (1) versus absence (0) manner on 14 items regarding various aspects of study design (e.g., clearly stated research questions, random assignment, blind experimenters, justification of sample size). Higher scores indicate a lower risk for bias. Two researchers individually rated the risk for bias for 22% ($n = 5$) of the studies included in the systematic review. Reliability was established (100% agreement). Risk of bias scores are summarized below and are provided as a descriptive measure.

Data extracted from each study included: sample size (parent-child dyads), child sex, child age, the nature of the target event (i.e., interactive, staged event, video, or medical procedure), the number of mothers (as opposed to fathers) included in the study, the nature of the parent-child discussion (i.e., unscripted, scripted questions, scripted readings), the number of days between the target event and the parent-child discussion, and the number of days between the parent-child discussion and the memory interview. Relevant measures from the parent-child discussions were also identified when applicable (e.g., types of parental questions such as open-ended, misleading). In addition, each study was classified as demonstrating misinformation (i.e., children reported misinformation presented by their parents during the memory interview), facilitative (i.e., children's subsequent reports contained more accurate information after conversing with a parent), or non-significant effects of the parent-child discussion on children's reports during the subsequent memory interview in a mutually exclusive manner. Given the importance of identifying whether parent-child discussions can hinder the reliability of children's forensic reports (Goodman et al., 1999, 2017; Newlin et al., 2015; O'Donohue et al., 2013; Powell & Lancaster, 2003), studies that demonstrated misinformation effects were classified as such regardless of whether the data also supported facilitative effects. Facilitative effects that accompanied misinformation effects are noted within the narrative review for the individual studies. Two researchers independently read and classified each study included in the review. Interrater reliability for study classification was excellent ($\kappa = .85$; 91% agreement). Discrepancies between the researchers were discussed and resolved. Two studies did not fit within this classification system are were coded as "other" (Alexander et al., 2010; Sun, Greenhoot, & Kelton, 2016; the classification of "other" is further described below).

Analytic approach

The studies identified through the systemic database search substantially varied in respect to research designs and dependent measures regarding children's memory. A meta-analysis was not feasible and would produce uninterpretable results given the heterogeneous nature of the eligible studies. Therefore, a systematic narrative synthesis of the results was conducted. To facilitate interpretation of the synthesis within the extant autobiographical memory and child witness literatures, retained studies were grouped and reviewed by whether parents were naïve, knowledgeable, or misled prior to discussing the target event with their children.

Results

Coding the database: descriptive information

Our search yielded 23 individual studies that met the inclusion criteria (Fig. 1). Collectively, 1,499 children aged 3-to 12-years-old participated in the studies included in the final database. Klemfuss and colleagues (2016) used a subsample of participants from the study conducted by Rush and colleagues (2017). Laimon and Poole (2008, Study 1) reanalyzed transcripts from the study conducted by Poole and Lindsay (2001). In addition, the study conducted by Poole and Dickinson (2014) was a follow-up to their 2011 study. Children who participated in these studies were counted once. The majority of studies ($n = 13$; 56%) included preschool and elementary-aged children. Eight studies (35%) included only preschoolers (5-year-olds and younger), and two studies (9%) included only elementary-aged children (6-year-olds and older). There was a wide range of sample sizes ($Mdn = 46$, $Min = 15$, $Max = 261$).

In the majority of the studies ($n = 14$; 61%), the target events were interactive in that children actively participated, followed by videos ($n = 5$; 21%), medical procedures ($n = 2$; 9%), and staged events that children observed ($n = 2$; 9%). Parents naturally talked with their children about the event (i.e., unscripted) in the majority of the studies ($n = 16$; 70%), followed by studies where parents read a book about the event to their children (i.e., scripted reading; $n = 7$; 30%), and studies where parents asked researcher-generated questions (i.e., scripted questions; $n = 3$; 13%). The sum of these percentages exceeds 100 because three studies (Galindo & Harris, 2017; Klemfuss, Rush, & Quas, 2016; Rush, Stolzenberg, Quas, & Lyon, 2017) incorporated both unscripted discussions and scripted questions into their designs.

The temporal proximity of the parent-child discussions in relation to the target events and the memory interviews was also variable across the studies. Two clusters emerged where the parent-child discussions occurred immediately after or on the same day as the target events in 48% of the studies ($n = 11$) and after an extended delay of three or more months in 26% ($n = 6$) of the studies. Children were interviewed within 1-week of the parent-child discussions in 74% ($n = 17$) of the studies. The target events, parent-child discussions, and memory interviews occurred within one day in four of the studies (Clarke-Stewart & Beck, 1999; Klemfuss et al., 2016; Rush et al., 2017; Sun et al., 2016). The number of days between the target events and parent-child discussions varied for participants in three studies (Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1994; MacDonald & Hayne, 1996; Schaaf, Bederian-Gardner, & Goodman, 2015). In addition, children participated in multiple memory interviews in six studies (Cleveland & Morris, 2014; Galindo & Harris, 2017; Laimon & Poole, 2008; Poole & Dickinson, 2014; Poole & Lindsay, 2001; Warren & Peterson, 2014).

Data extracted from the individual studies are presented in Tables 1–3. Table 4 presents a summary of the number of studies that

Table 1
Summary of studies with naïve parents.

Study	N (years; female)	Event	NM	Discussion format	E—D	D—I	Relevant discussion measures	Relevant memory measures	Sum
Alexander et al. (2010)	42 (7–12; 27)	Video: 24 picture-story stimuli	33	Unscripted	Immediate	1 week	Parental elaborations (questions asking for details or introducing new details)	Number of correct units of information recalled to open-ended questions	O
Leichtman et al. (2000)	15 (4–5; 8)	Interactive: visit from former teacher and her newborn during school	15	Unscripted	Same day	3 weeks	(1) maternal elaborativeness (wh-, yes/no, context, and evaluative statements); (2) number of correct details provided by child	Number of correct details and objects recalled to open-ended and directive questions	F
Leichtman et al. (2017)	40 (4–6; 17)	Interactive: science lesson in school	31	Unscripted	Same day	6 days	(1) parental elaborativeness (elaborative questions, yes/no questions, and context statements); (2) number of correct novel details, objects, concepts, and activities recalled by child	Number of correct objects, concepts, activities, and details recalled to open-ended and directive questions	F
Sun et al. (2016)	41 (4–7; 20)	Video: scene from *The Rescuers*	39	Unscripted: parents instructed to focus on facts of the video (n = 21) or emotions (n = 20)	Immediate	Immediate (following vocabulary assessment)	(1) parental fact-talk (prompting for video details); (2) parental associative-talk (talk related to the video, but not concerning its details); (3) correct and incorrect propositions provided by child	Number of correct and incorrect propositions provided to open-ended and directive questions	O
Warren and Peterson (2014)	79 (7–10; 40)	Video: scene of a theft in a candy store or in a waiting area	73	Unscripted	Immediate	Half immediate and 1 week, half 1 week	(1) parental open-ended, directive, yes/no questions, or statements; (2) correct and incorrect suggestive questions asked by parents	Whether children reported information consistent with parental suggestions (during 1 week interview) to open-ended questions	M

Note. NM = number of mothers; E—D = delay between target event and parent-child discussion. D—I = delay between parent-child discussion and memory interview. Sum = finding summary. F = facilitative effect. M = misinformation effect. O = other.

Table 2
Summary of studies with knowledgeable parents.

Study	N (years; female)	Event	NM	Discussion format	E—D	D—I	Relevant discussion measures	Relevant memory measures	Sum
Chae et al. (2014)	91 (3–6; 53)	Medical: inoculations that parents observed	NR	Unscripted: half discussed inoculations and half discussed neutral event	1 week	Same day	Did not evaluate	Correct and incorrect reports during open-ended, specific, and misleading questions	NS
Clarke-Stewart and Beck (1999)	45 (5–6; 21)	Video: watched a scene from *Prancer* together	45	Unscripted: 31 dyads discussed and 14 dyads did not discuss the video	Immediate	Immediate	(1) number of on-task conversational turns; (2) number of maternal questions; (3) whether mothers corrected child at least once; (4) maternal emotion words; (5) whether dyads had 5 + conversational turns regarding critical topics	Correct actions and character internal states provided when tasked with retelling the story	F
Cleveland and Morris (2014)	31 (3–5; 14)	Interactive: pretend zoo at laboratory that parents observed	NR	Unscripted: half autonomy- supportive and half elaborative- structure instructions	Same day	2 weeks and 8 months	(1) parental autonomy support (followed child's lead or own agenda); (2) parental open-ended questions	Number of correct zoo animals, features, and details recalled to open-ended and directive questions	F
Cleveland et al. (2007)	27 (3–4; 11)	Interactive: pretend zoo at laboratory that parents observed	NR	Unscripted: half perspective and half memory instructions	Same day	2 weeks	(1) parental autonomy support (followed child's lead or own agenda); (2) parental elaborative structure (elaborations and confirmations)	Number of correct zoo animals, features, and details recalled to open-ended and directive questions	F
Goodman et al. (1994)	46 (3–10; 28)	Medical: VCUG that parents partially observed	46	Unscripted: mothers reported whether they discussed the exam with their children	Varied	12 days	mothers reported whether they: (1) discussed the exam; (2) explained the exam; (3) asked questions; (4) lacked time to attend to child; (5) sympathetically talked to child	(1) free recall units correct, incorrect, and "I don't know?"; (2) correct, commission, omission, and "I don't know" responses to specific and misleading questions	F

Note. NM = number of mothers; E—D = delay between target event and parent-child discussion. D—I = delay between parent-child discussion and memory interview. Sum = finding summary. F = facilitative effect. M = misinformation effect. NS = non-significant effect. NR = not reported. VCUG = Voiding Cystourethrogram Fluoroscopy.

Table 3
Summary of studies with misled parents.

Study	N (years; female)	Event	N M	Discussion format	E—D	D—I	Relevant discussion measures	Relevant memory measures	Sum
Galindo and Harris (2017)*	25 (3–5; 13)	Video: scenes of mother-child interactions	25	Unscripted and scripted questions: dyads provided 9 questions to naturally discuss	Immediate	Immediate (after 5-minute filler) and 2–4 days	Whether children agreed with misinformation	Proportion of correct responses to option-posing questions (collapsed across the immediate and delayed memory interview)	M
Klemfuss et al. (2016)	68 (4–7; 38)	Interactive: play event, toy broke for half children	63	Unscripted or unscripted and scripted questions: half parents in suggestive group and half parents in control group	Immediate	Immediate: some assigned to Putative Confession interview	Number of parental suggestive questions	(1) correct responses to yes/no suggestive questions; (2) correct responses to yes/no questions about breakage	NS
Laimon and Poole (2008, Study 1)*	114 (3–8; 66)	Interactive: Mr. Science event	NR	Scripted reading: Books contained 2 experienced, 2 nonexperienced demonstrations, and 1 nonexperienced touch. Read book 3 times.	3 months	1 day and 1 month	Did not evaluate	Correct and incorrect details provided after additional prompting regarding responses to yes/no questions	M
MacDonald and Hayne (1996)	20 (3–4; 10)	Interactive: school trip to botanical gardens	NR	Unscripted: child initiated discussions, parent kept dairy of discussions	Varied	1 week	Number of unique activities, objects, people, affect, and descriptions recorded in the diary	Correct and incorrect number of activities, objects, people, affect, and descriptions recalled to open-ended and directive questions	F
Poole and Dickinson (2011)*	261 (4–9; 129)	Interactive: Mr. Science event. Half of the children touched by Mr. Science on the wrist and shoulder	NR	Scripted reading: Books contained 2 experienced and 2 nonexperienced demonstrations. Books for children who were not touched during the event also described 2 nonexperienced touches. Read book 3 times	4 months	1 day: half assigned to body-diagram-focused interview	Did not evaluate	(1) number of events reported; (2) correct and incorrect reports (modified word count) to open-ended and directive questions [body diagram]; (3) yes/no source-monitoring questions	M
Poole and Dickinson (2014)*	219 (5–12; 109)	Interactive: Mr. Science event. Half of the children touched by Mr. Science on the wrist and shoulder	NR	Scripted reading: Books contained 2 experienced and 2 nonexperienced demonstrations. Books for children who were not touched during the event also described 2 nonexperienced touches. Read book 3 times	4 months	1–2 years: half allowed to draw during interview	Did not evaluate	(1) number of events reported; (2) correct and incorrect amount of information recalled (modified word count) to open-ended questions; (3) proportion of correct response to yes/no questions; (4) yes/ no source-monitoring questions	M
Poole and Lindsay (1995, Session 2)*	17 (3–4; 8)	Interactive: Mr. Science event	NR	Scripted reading: Books contained 2 experienced, 2 nonexperienced demonstrations, and 1 nonexperienced touch. Read book 3 times	3 months	1 day	Did not evaluate	(1) number of events reported; (2) correct and incorrect syntactic units, inaccurate-coached syntactic units recalled to open-ended questions; (3) proportion of "yes" responses to yes/no questions; (4) yes/ no source-monitoring questions	M
Poole and Lindsay (2001)*	114 (3–8; 66)	Interactive: Mr. Science event	NR	Scripted reading: Books contained 2 experienced, 2 nonexperienced demonstrations, and 1 nonexperienced touch. Read book 3 times	3 months	1 day and 1 month	Did not evaluate	(1) number of events reported; (2) correct and incorrect details provided after additional prompting regarding responses to yes/no questions	M

Table 3 (*continued*)

Study	N (years; female)	Event	N M	Discussion format	E—D	D—I	Relevant discussion measures	Relevant memory measures	Sum
								(1) number of events reported; (2) correct syntactic units, detail errors, suggested information to open-ended and yes/no questions; (3) proportion of "yes" responses to yes/no questions; (4) yes/no source-monitoring questions	M
Poole and Lindsay (2002)*	132 (3–8; 70)	Interactive: Mr. Science event	NR	Scripted reading: Books contained 2 experienced, 2 nonexperienced demonstrations, and 1 nonexperienced touch. Read book 3 times	3 months	1 day: source monitoring training at beginning or end of interview	Did not evaluate	(1) number of events reported; (2) proportion of events reported to open-ended, yes/no, and leading questions; (3) yes/no source-monitoring questions	M
Principe et al. (2013)	117 (3–5; 67)	Staged event: magic show	117	Unscripted: control, neutral, suggestive letter conditions	1 week	Same day	Maternal elaborative statements (memory questions, yes/no elaborations, statement elaborations, evaluations)	(1) correct and incorrect propositions and (2) reports of loose rabbit to open-ended, yes/no, and leading questions; (3) elaborations about loose rabbit	M
Principe et al. (2017)	108 (4–5; 54)	Staged event: magic show	108	Unscripted: all mothers were told the rabbit got loose	1 week	Same day	(1) maternal elaborative statements (memory questions, yes/no elaborations, statement elaborations); (2) maternal control (degree to which mothers followed own agenda or child's lead); (3) number of maternal biasing techniques	(1) correct and incorrect propositions and (2) reports of loose rabbit to open-ended, yes/no, and leading questions; (3) elaborations about loose rabbit; (4) yes/no source-monitoring question	M
Rush et al. (2017)	188 (4–7; 98)	Interactive: play event, toy broke for half children	169	Unscripted or unscripted and scripted questions: half parents in suggestive group and half parents in control group	Immediate	Immediate: half assigned to Putative Confession interview	(1) number of questions asked; (2) type of questions (open-ended, closed-ended, follow-up, facilitating); (3) whether parents motioned breakage; (4) whether child disclosed breakage	Whether children disclosed breakage (true and false disclosures) to open-ended, directive, and yes/no questions	NS
Schaaf et al. (2015)	60 (4 and 6; NR)	Interactive: play event	NR	Scripted reading: Books contained either accurate or inaccurate information about play activities. Read book 2 times	NR	2 weeks: half given logic-of-oppression training at beginning of interview	Did not evaluate	Correct and incorrect responses to directive questions	M

Note. NM = number of mothers; E—D = delay between target event and parent-child discussion. D—I = delay between parent-child discussion and memory interview. Sum = finding summary. F = facilitative effect. M = misinformation effect. NS = non-significant effect. NR = not reported. * = children completed a baseline memory interview immediately after the target event.

Table 4
Number of studies demonstrating facilitative, misinformation, non-significant, and other effects by parental bias.

Parental bias	Summary of study findings				Total
	Facilitative	Misinformation	Non-significant	Other	
Naïve	2 (40%; 29%; 9%)	1 (20%; 9%; 4%)	0 (0%; 0%; 0%)	2 (40%; 100%; 9%)	5 (22%)
Knowledgeable	4 (80%; 57%; 17%)	0 (0%; 0%; 0%)	1 (20%; 33%; 4%)	0 (0%; 0%; 0%)	5 (22%)
Misled	1 (8%; 14%; 4%)	10 (77%; 91%; 44%)	2 (15%; 67%; 9%)	0 (0%; 0%; 0%)	13 (56%)
Overall	7 (30%)	11 (48%)	3 (13%)	2 (9%)	23

Note. Cell formatting in the naïve, knowledgeable, and misled rows: # studies by parental bias and finding summary intersection (% of studies per parental bias row; % of studies per finding column; % of studies from database). Formatting for overall row: # studies per finding summary column (% of studies from database). Formatting for total column: # studies per parental bias row (% studies from database).

demonstrated facilitative, misinformation, and non-significant effects of the parent-child discussions on the accuracy of children's reports during the memory interviews by parental bias. In the following sections, an overview of the findings is presented followed by a narrative synthesis of the studies grouped by parental bias.

Overview of study findings and risk of bias

Nearly half of the studies found misinformation effects, followed by facilitative effects, non-significant effects, and "other" (see Table 4). The majority of studies that found misinformation effects (91%) were from studies where parents were misled. Conversely, the majority of studies that found facilitative effects (57%) were from studies where parents were knowledgeable about the target events. Two-third of the studies that found non-significant effects were from studies with misled parents and a third were from studies with knowledgeable parents. Two studies that were classified as "other" were from studies where parents were naïve.

The risk for bias was generally low for the studies included in the review ($M = 9.96$, $Min = 7$, $Max = 13$, out of 14 items). All studies provided clearly stated objectives, a defined sample, and operational definitions of dependent measures. However, the majority of the studies included in the review did not provide sample size justification ($n = 19$, 83%). In the next three sections, studies are reviewed according to the experimental methodology of whether parents were naïve, knowledgeable, or misled prior to conversing with their children.

Reports after discussing experiences with naïve parents

In the first group of studies, parents were naïve regarding the details of the events their children experienced. We located five studies where parents were not provided information regarding the details of the target events prior to conversing with their children (22% of the studies in the database; see Table 1). These studies included 217 child participants (14% of the total sample). In all five studies, parents naturally discussed the target events with their children without being provided details or scripted questions from researchers. Parent-child discussions occurred within the same day of the target events in all five studies and the memory interviews occurred immediately to 3-weeks after the parent-child discussions. Two studies with naïve parents demonstrated facilitative effects, one study demonstrated misinformation effects, and two studies were classified as "other" (Table 4). Given that parents naturally discussed the target events with their children in all five studies with naïve parents, the findings are further reviewed according to the influence of parental questioning on the accuracy of children's reports during the memory interviews and associations between children's memory in both contexts.

Effects of parental questioning. Three studies with naïve parents (Alexander et al., 2010; Sun et al., 2016; Warren & Peterson, 2014) found that variation in parental questioning was associated with the amount of information children reported during subsequent memory interviews. Parents in the study conducted by Warren and Peterson (2014) asked significantly more questions requiring limited answers such as two-option forced choice questions than open-ended questions (i.e., prompts that elicit free recall responses, such as "Tell me what happened") when discussing a video of a theft (which the parents did not watch) with their 7- to 10-year-olds. Parents were instructed to question their children as they thought they would if their children actually witnessed a theft. Children provided the most information during the parent-child discussions when asked open-ended questions, with less information provided when parents asked yes/no questions. This finding is consistent with the broader child witness literature (Lamb, Orbach, Hershkowitz, Esplin, & Horowitz, 2007). In addition, 28% of the parents produced self-generated suggestive questions, of which 65% were misleading. During the memory interviews that occurred 1-week after the target event, children recounted 100% of the details from the accurate suggestive questions and 25% of the details from misleading questions during free recall. These findings support misinformation effects because a quarter of the inaccurate information presented by parents was later recalled by children during the memory interviews. Although note that the details from accurate parental suggestions were also subsequently reported by children.

Alexander et al. (2010) and Sun et al. (2016) showed that parents' natural questioning styles more generally, as opposed to the use of self-generated suggestive questions, was associated with the amount of correct information children recalled about a video during a subsequent memory interview. Alexander et al. (2010) found that parental elaboration (i.e., prompting for details and providing event details) was negatively associated with the amount of correct information 7- to 12-year-olds provided in their free recall accounts regarding a stressful video during a subsequent memory interview when controlling for child and parental attachment

styles. Incorrect responses were not evaluated in this study. In another study, Sun et al. (2016) found that parental associative-talk (i.e., talk related to the video, but not concerning its details), rather than parental fact-talk (i.e., prompting for video details), was negatively associated with the number of correct details 4- to 7-year-olds subsequently provided when asked open-ended and directive questions (i.e., wh- questions requesting additional information). Neither parental fact-talk nor associative-talk was significantly associated with the number of incorrect details children later recalled. The observations from both of these studies were classified as "other" given that parental natural questioning styles were negatively associated with the amount of *correct* information as opposed to the amount of incorrect information children later recalled.

Associations between children's recall in parent-child discussions and memory interviews. Two studies conducted by Leichtman and colleagues (2000, 2017) found that the number of details children recalled during the parent-child discussion about a school event was positively associated with the amount of correct details children provided to open-ended and directive questions during the memory interview when controlling for parental elaborativeness. In the study conducted by Leichtman, Pillemer, Wang, Koreishi, and Han (2000), parental elaborativeness (i.e., wh- questions, yes/no questions, elaborative statements, and context statements) was positively associated with the amount of correct information 4- and 5-year-olds recalled during the parent-child discussion and during the memory interview. However, parental elaborativeness was not significantly associated with the amount of correct details 4- to 6-year-olds recalled during the memory interview in Leichtman et al.'s (2017) study. Furthermore, in both studies, the amount of correct details children recounted during the parent-child discussion was a stronger predictor of the number of correct details children recalled during the memory interviews than parental elaborativeness. Many of the details children recalled during the memory interviews were previously recounted by children during the parent-child discussions (83% of objects recalled in Leichtman et al., 2000; 31–60% of objects, activities, and concepts recalled in Leichtman et al., 2017).

Summary of findings for studies with naïve parents. Collectively, the evidence from the aforementioned studies demonstrates that certain elements of parent-child discussions were associated with the amount of correct information children reported during subsequent memory interviews. Consistent with the larger literature on mother-child reminiscing (Fivush, 2011; Fivush et al., 2006), parental elaborativeness (Leichtman et al., 2000) and children's own contributions during the parent-child discussions were associated with the amount of accurate information children later recounted to researchers (Leichtman et al., 2000, 2017). However, the findings also indicate that intrusive parental questioning (high elaborative and associative talk) may also be associated with decreases in the amount of correct information children later report, perhaps by limiting opportunities for children to practice recalling on-topic details themselves during the parent-child discussions (Alexander et al., 2010; Sun et al., 2016). In addition, misinformation effects may be observed when naïve parents naturally self-generate misleading questions (Warren & Peterson, 2014). Whether discussions with naïve parents bolster or impede the reliability of children's subsequent reports is unclear based on the extant research. Further research will be necessary to explicate the current observations.

There are important limitations of this group of studies. First, the studies were correlational and descriptive in nature. Conclusions regarding causality cannot be made from these studies. For example, the data from Leichtman et al. (2000, 2017) are equivocal regarding whether children who recount more information in one context are likely to recall more information in another context or if the parent-child discussions fostered the amount of correct information children later recounted. In addition, three of the five studies did not examine the amount of incorrect information children provided during the parent-child discussions nor during the memory interviews (Alexander et al., 2010; Leichtman et al., 2000, 2017). Therefore, whether and how discussions with naïve parents are associated with the reliability of children's reports during a subsequent memory interview as indexed by the amount of incorrect information provided (as opposed to the amount of correct information recalled) is unclear. Furthermore, the temporal intervals in these studies were short, with all of the parent-child discussions occurring within the same day of the target events and the memory interviews occurring within 1-week after the target events in all but one of the studies (Leichtman et al., 2000). Because many children involved in child maltreatment investigations delay disclosing abuse (London et al., 2005; Malloy et al., 2013) and investigations can last months or years, examining associations between delayed discussions with naïve parents and the amount of correct and incorrect information children report during later memory interviews is warranted.

Reports after discussing experiences with knowledgeable parents

Parents had accurate information about the target events prior to conversing with their children in five studies (22% of the studies in the database; see Table 2), which included 240 child participants (16% of the total sample). In all five studies, parents observed the target events and had accurate first-hand knowledge regarding their children's experiences. In addition, parents naturally discussed the target events with their children and were not provided scripted questions or readings from researchers in all of these studies. Four studies found facilitative effects and one study found non-significant effects of the parent-child discussions on children's subsequent reports during the memory interviews (Table 4). In addition, because none of these studies evaluated associations between children's contributions during the parent-child discussions and the memory interviews, the distinction between parental and child influence on children's subsequent reports was not applicable.

Inspired by the necessity of understanding children's memory for stressful experiences, Chae et al. (2014) and Goodman et al. (1994) evaluated the effects of parent-child discussions on children's subsequent memory for medical procedures. Chae et al. (2014) examined children's memory for inoculations that occurred 1-week prior and found that whether 3- to 6-year-olds were randomly assigned to discuss the inoculations or a neutral event with their parent immediately before engaging in the memory interview did not significantly influence children's reports to open-ended, specific, and misleading questions. However, Goodman et al. (1994) found that 3- to 10-year-olds who reportedly discussed a Voiding Cystourethrogram Fluoroscopy (VCUG) with their mothers correctly answered more misleading questions (e.g., "Didn't the doctor look in your ears when he gave you that test?") posed by researchers

during the subsequent memory interview that occurred 12-days after the procedure compared with children who reportedly did not discuss the procedure with their mothers. Whether parents and children discussed the VCUG did not significantly influence the amount of correct and incorrect information children provided when asked open-ended questions.

Additional studies with knowledgeable parents examined children's memory for relatively positive experiences. In these studies, whether children discussed the target events with a parent prior to the memory interview (Clarke-Stewart & Beck, 1999) and the instructions provided to parents prior to the parent-child discussion (Cleveland & Morris, 2014; Cleveland, Reese, & Grolnick, 2007) were experimentally manipulated. Mothers and children who participated in the study conducted by Clarke-Stewart and Beck (1999) watched a video together and, after the video, approximately two-thirds of the dyads were instructed to naturally discuss its content. When prompted to retell the story in the video with open-ended questions during a memory interview occurring directly after the parent-child discussion, 5- and 6-year-olds who discussed the video with their mothers reported significantly more correct actions and internal thoughts of the characters compared with children who did not discuss the video with their mothers. In addition, for children who discussed the video with their mothers, the extent to which mothers corrected their children's mistakes, asked questions, used emotion words, and engaged in extended exchanges on critical topics (e.g., multiple questions, clarifications, and elaborations regarding central topics of the video) were positively associated with the amount of correct information children reported during the memory interview.

Cleveland et al. (2007, 2014) experimentally manipulated instructions given to parents regarding the general objective for the parent-child discussions concerning a pretend zoo event (that parents observed) and examined whether the number of correct details children recalled when asked open-ended and directive questions during the memory interview differed according to the instructions that parents were provided. Prior to conversing with their children, parents who participated in the 2007 study were told that their children's *perspective* or *memory* for the zoo event would be assessed during the subsequent memory interview. Whether parents were told that their children's perspective or memory would be evaluated did not significantly influence the number of correct objects, actions, and descriptors 3- and 4-year-olds recalled during the memory interview that occurred 2-weeks later. However, there was a significant and positive association between parental elaborativeness during the parent-child discussion (i.e., the number of parental open-ended questions, yes/no questions, elaborative statements, and confirmations) and the number of correct details children recounted during the memory interview.

Cleveland and Morris (2014) manipulated whether parents received *autonomy-supportive* (told to emphasize their child's perspective) or *elaborative-supportive* (told to emphasize their children's memory) instructions prior to naturally conversing with their 3- to 5-year-olds about the pretend zoo event. Parents randomly assigned to the autonomy-supportive condition were further instructed to follow their children's lead during the conversation. Parents assigned to the elaborative-supportive condition were told to ask wh-questions and to mention event details. Children participated in memory interviews 2-weeks and 8-months after the zoo event. During the memory interview occurring 2-weeks after the zoo event, children of elaborative-supportive parents recalled significantly more correct details during open-ended and directive questioning compared with children of parents in the autonomy-supportive condition. However, during the memory interview occurring 8-months after the event, children of autonomy-supportive parents recalled significantly more correct details when asked directive questions compared with children of elaborative-supportive parents. Significant group differences in the amount of correct information children provided during the open-ended phase of the 8-month memory interview were not observed.

Summary of findings for studies with knowledgeable parents. The majority of the aforementioned empirical evidence suggests that children's reports during subsequent memory interviews benefited from discussions with knowledgeable parents, especially when parents talked in elaborative ways (but see Chae et al., 2014). Parental autonomy support may be particularly relevant for children's long-term memory (Cleveland & Morris, 2014). In addition, results from the study conducted by Cleveland and Morris (2014) show that parents' objectives for conversing with their children may affect children's subsequent memory for their experiences (but see Cleveland et al., 2007). This finding complements the extant work on interviewer bias (Ceci & Bruck, 1993, 2006).

Although important in elucidating the role of parent-child discussions on children's later memory reports, the studies with knowledgeable parents are limited in their forensic relevance because: (1) all children truly experienced the event, and (2) parents observed the event and therefore knew what occurred. The fact that many parents observed the target events in these studies as opposed to not observing the target events but being given accurate information is an important distinction. Parents who witnessed or experienced an event with their children become somewhat of an authority regarding the details of the event, which may alter how parents question their children and children's reactions to parental questioning (Ceci, Ross, & Toglia, 1987; Reese & Brown, 2000). In addition, because children actually experienced the events in question and their parents witnessed the events, it is unlikely that the dyads would discuss erroneous information. Indeed, the amount of incorrect information recounted by children was not examined in three of the studies with knowledgeable parents (Clarke-Stewart & Beck, 1999; Cleveland & Morris, 2014; Cleveland et al., 2007). In forensic contexts, non-offending parents seldom witness the events in question and rarely have conclusive knowledge about their children's experiences, especially upon initial questioning. The more forensically applicable scenario is one where parents did not witness the event, but had some expectations regarding their children's experiences prior to questioning their children.

Retrospective studies demonstrate that non-offending parents of sexually abused children are often initially motivated to question their children about potential maltreatment because their children showed suspicious behaviors or made concerning statements that parents believed may have indicated sexual abuse (Plummer, 2006; Reitsema & Grietens, 2015). Parental suspicion regarding the unknown events may or may not be accurate. The data from the aforementioned studies suggest that parent-child discussions may bolster the amount of correct information children report in later interviews when parents' *a priori* beliefs are an accurate reflection of their children's experiences. More research is needed to further corroborate this possibility. In the next section, studies evaluating the effects of inaccurate parental biases on the accuracy of children's subsequent event reports are reviewed.

Reports after discussing experiences with misled parents

Given that forensic professionals are concerned that initial questioning from erroneously biased parents may hinder the reliability of children's subsequent forensic reports (Goodman et al., 1999; Rivard & Compo, 2017), it is not surprising that the majority of the studies included in our database ($n = 13$; 56% of the studies in the database; see Table 3) examined the accuracy of children's reports after discussing experiences with parents who were provided inaccurate information about the target events. Collectively, these studies included 1,042 child participants (70% of the total sample). In all of these studies, parents did not witness the target events and elements of accurate and inaccurate event details were provided to parents prior to conversing with their children. Parents were given both accurate and inaccurate information in the majority of these studies ($n = 10$; 77%). Whether parents were given accurate or inaccurate information was experimentally manipulated in two studies (Principe, DiPuppo, & Gammel, 2013; Schaaf et al., 2015). Parents who participated in the study conducted by Principe, Trumbull, Gardner, Van Horn, and Dean (2017) were given a false suggestion. Ten studies with misled parents found misinformation effects, two found non-significant effects, and one found facilitative effects (Table 4). Below we further review the studies according to whether parents were instructed to recite a scripted reading to their children ($n = 7$; 54% of the studies with misled parents) or to naturally converse with their children about the target events ($n = 6$; 46%).

Effects of scripted readings. Seven studies with mislead parents found misinformation effects when parents read books to their children that contained erroneous information (Laimon & Poole, 2008; Poole & Dickinson, 2011, 2014; Poole & Lindsay, 1995, 2001, 2002; Schaaf et al., 2015). Poole et al. (1995, 2001, 2002, 2008, 2011, 2014) conducted a series of studies examining children's memory for an interactive "Mr. Science" event that consisted of various science experiments. After the Mr. Science event, parents read a book to their children that contained experienced and nonexperienced activities from the Mr. Science event. To increase the ecological validity of their studies to experiences on which children testify, all of these studies incorporated elements of actual or suggested innocuous touch. Although the particular procedures differed across the studies, generally, children participated in a baseline interview immediately following the Mr. Science event, parents read the book to their children on three consecutive days approximately three-months after the event, and the memory interview occurred on the day following the last reading (but see Poole & Dickinson, 2014).

Several consistent findings emerged from this program of study. First, many children recounted nonexperienced events from the scripted reading while providing free recall reports during the memory interview. For example, 41% of 3- and 4-year-olds reported an nonexperienced event from the book reading during free recall in the Poole and Lindsay (1995, session 2) study. In the 2001 and 2002 studies, approximately 10–22% of the reported events in response to open-ended questions were consistent with the nonexperienced events described in the scripted reading, with 8% of the recalled events in the 2001 study involving suggested touch. Furthermore, many children continued reporting suggested touch and elaborated upon this false suggestion when asked option-posing questions (Laimon & Poole, 2008). When directly asked, 53% of 3- and 4-year-olds in the 1995 study and 33–42% of 3- to 8-year-olds in the 2001 study assented to suggested touch that was introduced in the reading (e.g., Mr. Science put something yucky in their mouths or hurt their tummies). More recently, Poole and Dickinson (2014) observed that approximately a third of 5- to 12-year-olds reported false suggested touch during the memory interview when asked yes/no questions. In addition, in their 2011 study, 25% of 4- to 9-year-olds reported false suggested touch when interviewers used body diagrams, a popular forensic interviewing tool. Importantly, the rate of assents to questions regarding false suggested events consistently exceeded the rate of assents to false controls (non-experienced events not mentioned in the scripted reading), suggesting that exposure to nonexperienced events via the scripted reading negatively impacted the veracity of children's reports beyond the effects of delay (Poole & Lindsay, 1995, 2001).

Although many children in Poole and colleagues' studies readily recalled false suggested details and elaborated upon such erroneous suggestions during the memory interviews, children's subsequent memory also benefited from exposure to experienced events included in the scripted readings. During the memory interviews, children consistently reported more experiences that occurred during the science event and that were also mentioned in the scripted readings compared with experiences that were not included in the readings (Poole & Lindsay, 1995, 2001, 2002). In addition, the memory interviews in these studies often included source-monitoring questions where children were generally tasked with recalling the scripted reading, practicing how to answer source-monitoring questions (e.g., if something did not happen, say no), and then answering yes/no questions regarding whether a particular activity actually occurred. Regardless of age, children often correctly reported that experienced events actually happened. However, many children, especially younger children (Poole & Dickinson, 2011; Poole & Lindsay, 2001), reported that the non-experienced suggested events also actually occurred (Poole & Dickinson, 2014; Poole & Lindsay, 1995, 2002). Furthermore, findings from Poole and Lindsay's 2002 study indicate that older children (7- and 8-year-olds) may benefit from source-monitoring training prior to the interview, but younger children may not.

In a similar study, Schaaf et al. (2015) evaluated 4- and 6-year-olds' responses to directive questions during a memory interview occurring 2-weeks after a targeted play event. After the play event, parents were randomly assigned to read books that contained only accurate or only inaccurate event details to their children. Children who were exposed to inaccurate information via the scripted readings provided significantly fewer correct answers and reported more inaccurate information consistent with the erroneous details described in the scripted readings compared with children who were read books with only accurate information. However, children who were read books with inaccurate event details and who were also instructed to report only what *really* happened during the play session (i.e., logic-of-oppression training) provided fewer responses consistent with the erroneous information presented in the books compared with children who were read books with inaccurate details and not provided such instructions prior to the memory interview.

Collectively, the aforementioned studies with scripted readings suggest that misinformation effects can be encouraged through

exposure to erroneous information from a parent. However, the generalizability of these findings to real-life situations is limited by the scripted nature of the parent-child discussions. In the following section, studies where parents were exposed to misinformation about the target events and were instructed to naturally discuss the experiences with their children are reviewed.

Effects of unscripted parental questioning. We identified six studies with misled parents where parents and children naturally discussed the target events. Elements of scripted questions were introduced in three of these studies (Galindo & Harris, 2017; Klemfuss et al., 2016; Rush et al., 2017). One of these studies found facilitative effects (MacDonald & Hayne, 1996), two found non-significant effects (Klemfuss et al., 2016; Rush et al., 2017), and three found misinformation effects (Galindo & Harris, 2017; Principe et al., 2013, 2017; see Table 3).

MacDonald and Hayne (1996) conducted a unique study where parents were instructed to allow their 3- and 4-year-olds to initiate any conversations about a school fieldtrip to the local botanical gardens. Parents hand-recorded details that their children told them in a booklet, which contained a list of accurate and inaccurate activities that may have occurred during the fieldtrip. Parents were instructed to indicate whether their children recounted the listed activities, but were not explicitly instructed to inquire about these items. All children initiated at least one discussion with their parent before the memory interview that occurred 1-week after the fieldtrip. When asked open-ended and directive questions during the memory interview, less than 3% of the details children recounted were inaccurate. In addition, in parallel to studies conducted by Leichtman et al. (2000, 2017), children who reported more details to their parents also provided more details during the memory interview. These results indicate that natural conversations with misled parents may not be associated with decreases in the amount of accurate information children report when parents allow their children to initiate discussions and parental exposure to inaccurate information prior to conversing with their children is mild.

In the studies conducted by Klemfuss et al. (2016) and Rush et al. (2017), 4- to 7-year-olds participated in a play session with a researcher in which approximately half of the children were randomly assigned to a condition where two of the toys were staged to break in their hands. For these children, the researcher requested secrecy about the broken toys. Before talking with their children, parents were provided a list of toys that were in the room and were told that two of the toys may have broken. Parents were further randomly assigned to the suggestion or control group. Parents in the *suggestion* group were additionally instructed to elicit children's memory for both positive and negative experiences that may have occurred, received scripted suggestive questions, and were instructed to reassure their children that toys often break and that they should tell them if a toy broke. Parents in the *control* group were not provided scripted questions or any other additional information.

As reported by Rush et al. (2017), false reports of broken toys were rare during the memory interview (5% of the children in the no-break condition disclosed breakage). Whether parents were assigned to the suggestion or control condition did not significantly influence whether children who did not experience toy breakage later provided a false report (Rush et al., 2017). In addition, whether parents were in the suggestive condition did not influence children's responses to suggestive questions during the interview (Klemfuss et al., 2016). However, the generalizability of these findings to the forensic arena is limited by the temporal constraints of the study design as the play session, parent-child discussion, and memory interview occurred in immediate succession of each other in these studies. This design does not allow for the passage of time that is often necessary to observe misinformation effects (Loftus, 2005).

Beyond determining whether natural conversations with misled parents can hinder the reliability of children's subsequent reports, researchers have attempted to identify moderators that further elucidate the manner in which the accuracy of children's subsequent reports is (or is not) influenced by previous discussions with misled parents. In one such study, Galindo and Harris (2017) evaluated whether 3- to 5-year-olds' acquiescence to misinformation presented by their mothers about a video influenced whether they were likely to report such misinformation during memory interviews occurring immediately and 2- to 4-days after the discussion. In this study, preschoolers and their mothers separately watched a video depicting interactions between a mother and her child. Dyads were told that the videos were identical, but they actually contained several discrepancies. After watching the video, mothers and their children independently completed a baseline memory interview and then were reunited to discuss nine researcher-generated questions regarding the video. Dyads were instructed to naturally discuss the questions and to provide an agreed-upon answer for each item. Three of the questions regarded discrepancies between the videos and served as the misinformation manipulation.

Mothers virtually always exposed their children to misinformation (96% of the time) by mentioning what she saw in her version of the video when discussing the discrepant items. Children's memory for the discrepant items after the parent-child discussions was not significantly different from the baseline memory interviews. This finding suggests that simply discussing the discrepant items did not lead to misinformation effects. However, children who deferred to their mothers' views of the discrepant items during the parent-child discussions incorrectly answered yes/no questions regarding the discrepant details approximately 45% of the time during the subsequent memory interview. Children who deferred to their mother's opinions also had poorer memory for the discrepant items during the baseline memory interview compared with children who did not agree with their mothers' inconsistent views. Galindo and Harris (2017) concluded that children's baseline memory for the target details and children's reactions to misinformation presented by their mothers, as opposed to simply being exposed to erroneous details, are critical factors to consider when inquiring whether misinformation effects may have occurred. This finding is discrepant with at least two studies that found children's rates of assents during an initial suggestive interview with a researcher was not associated with children's later tendency to report misinformation during a memory test (Ackil & Zaragoza, 1998; London et al., 2009). In those studies, children tended to incorporate the misinformation presented by a researcher regardless of their initial assents during prior suggestive interviews.

Two studies conducted by Principe et al. (2013, 2017) examined children's memory for an observed magic show in which the magician failed to pull a rabbit out of his hat without explanation. One-week after children watched the magic show, mothers were instructed to naturally discuss the event with their children, and the memory interviews occurred later that day. In the 2013 study, mothers were randomly assigned to the *control* condition (no conversation), the *neutral* condition, or the *suggestive* condition. Mothers in the neutral condition were informed that the trick failed and were instructed to question their children in a natural manner to find

out what happened. Mothers in the suggestive condition were additionally instructed to ask their children whether they remembered the rabbit being loose in school. Principe et al. (2017) design was nearly identical to the 2013 study with the exception that virtually all mothers received the suggestive instructions. Maternal elaborativeness (i.e., a composite of wh- questions, yes/no questions, and statements containing new information about the target event) was evaluated in both studies. Principe et al. (2017) also examined the degree to which mothers were controlling (e.g., negated their child's perspective) or autonomy supportive (e.g., followed their child's lead) during the parent-child discussions. The number of suggestive techniques employed by mothers, such as repeating questions and asking children to imagine the loose rabbit, was also examined in the 2017 study.

In the 2013 study, Principe and colleagues found that the number of correct details 3- to 5-year-olds provided during the memory interview was positively associated with maternal elaborativeness and with the number of correct details children recounted during the mother-child discussion. However, the benefit of maternal elaborativeness came at a cost when mothers were in the suggestive condition. A fifth of the children with misled mothers later recalled the loose rabbit during free recall, and 28% of these children reported that the rabbit was loose when asked leading questions. In addition, 80% of the children with misled and *high elaborative mothers* reported and elaborated upon the details of the loose rabbit (providing eight additional details on average) during the course of the memory interview. Whereas, 40% of the children with misled and *low elaborative mothers* recalled and provided details about the loose rabbit.

The results from the 2017 study further identified that whether 4- and 5-year-olds later recalled the loose rabbit during the memory interview was associated with maternal elaborativeness, maternal control, and maternal use of suggestive techniques during the parent-child discussion. In this study, virtually all children (93%) of *high elaborative and controlling* mothers reported the loose rabbit at some point during the memory interview, with 38% of these children doing so during free recall. In addition, many of these children (41%) reported that they actually saw the loose rabbit rather than only hearing about it from their mothers. A significant minority of children (39%) of *low elaborative and autonomy supportive* mothers reported details consistent with the loose rabbit, with one child recounting the loose rabbit during free recall and one child reporting that they actually saw the rabbit. In addition, children of mothers who used more than two suggestive techniques were more likely to report the loose rabbit during free recall and were more likely to say that they actually saw the loose rabbit during the memory interview compared with children of mothers who used less than two suggestive techniques during the parent-child discussion. Mothers who believed that the rabbit actually got loose were more controlling and used more suggestive techniques during the parent-child discussion.

Summary of findings for studies with misled parents. Three central findings emerged from the studies with misled parents. First, the findings demonstrate that children's free recall reports, which are typically considered the gold standard of evidence, can be tainted by exposure to incorrect information delivered by parents when the parent-child discussions and memory interviews occur after delays as short as 1-week after the target event. Second, such misinformation effects are not limited to peripheral details. A substantial minority of children in the aforementioned studies later recalled erroneous information regarding events that one may assume to be salient and memorable, such as touch (Poole & Dickinson, 2011, 2014; Poole & Lindsay, 1995, 2001, 2002) and witnessing a loose rabbit running around their school (Principe et al., 2013, 2017). Lastly, many children reported that the suggested events really happened, even when provided source-monitoring training or questions aimed to attenuate reporting of erroneous suggestions (Poole & Lindsay, 2001, 2002; Principe et al., 2013, 2017; but see Schaaf et al., 2015).

In addition, data from the studies conducted by Galindo and Harris (2017) and Principe et al. (2013, 2017) demonstrate that whether unscripted discussions with misled parents were associated with misinformation effects in children's subsequent reports at least partly depends on *how* parents and children discuss the erroneous information. The nature of the suggested information may also be important. For example, when discussing elements of events for which mothers and their children have conflicting views, children's memory prior to the parent-child discussion and their reactions to maternal questioning via assenting to their mother's viewpoint (as opposed to disagreeing with their mother) are important gateways for misinformation effects. However, when discussing false events that did not occur (such as the loose rabbit), the degree to which mothers introduced the erroneous information in an elaborative, controlling, and suggestive manner was associated with the likelihood that misinformation effects occurred (Principe et al., 2013, 2017). These results mimic what is known about general interviewing techniques. That is, children are more prone to exhibit misinformation effects when an initial interview is conducted in an accusatorial and coercive manner as compared with milder suggestive techniques (for review Ceci & Bruck, 1993, 2006).

Perhaps the best evidence regarding how parents question their children about suspected abuse comes from a field study conducted by Korkman, Juusola, and Santtila (2014). In this study, Korkman and colleagues identified sexual abuse cases where parents electronically recorded their children's statement as their children disclosed abuse to their parents. The recordings revealed that parents relied on option-posing and suggestive questions and rarely provided opportunities for children to recount their own perspectives of their experiences. In approximately 70% of the conversations, all new information about the allegation was initially introduced by parents rather than the children. This questioning style is likely reflective of the internal urgency parents encounter when suspecting that their children may have been harmed or are in imminent danger. However, data from the studies conducted by Principe et al. (2013, 2017) suggest that such coercive questioning may interfere with the reliability of children's succeeding forensic reports if parents introduced inaccurate information to their children.

Although the evidence from the studies with misled parents have important implications for forensic investigations involving child witnesses, they are not without limitations. The majority of the studies with misled parents incorporated scripted readings as the medium for parent-child conversations as opposed to natural discussions. Children were often repeatedly exposed to such scripted readings over multiple occasions. Although internal validity increases when standardizing the information to which children are exposed, compromises to ecological validity reduces the generalizability of these observations to contexts of natural parent-child discussions. Furthermore, the generalizability of the studies with natural parental inquiry is limited by short temporal delays between

the target event, parent-child discussion, and memory interview (Galindo & Harris, 2017; Klemfuss et al., 2016; Rush et al., 2017), the fantastical nature of the suggested information (i.e., the loose rabbit, Principe et al., 2013, 2017), and the mild presentation of the misinformation to parents (MacDonald & Hayne, 1996).

Current research methods for inducing parental bias and motivation for questioning their children lack the urgency and motivation parents likely face when suspecting abuse (Korkman et al., 2014). Parental questioning occurring within the context of maltreatment allegations is often evoked by sincere concern that their children may have been harmed or may be in danger, and parental need to inquire about their suspicions to protect their children (Plummer, 2006; Reitsema & Grietens, 2015). As researchers continue to evaluate the accuracy of children's event reports after discussing experiences with a parent, creative and ethical designs that better approximate the contexts of parent-child discussions about experiences on which children testify will be necessary.

Discussion

The overarching goals of this research review were to discover the scope of the extant empirical literature evaluating the objective accuracy of children's memory for events after discussing experiences with a parent and to identify patterns among the data in order to provide recommendations for future research and for forensic professionals. The results from the systematic database search revealed a sizable, and growing, number of studies addressing concerns of the current investigation. Collectively, the studies were rated has having moderately low levels for risk of bias, suggesting that the findings of the individual studies generally appeared to be valid and not attributable to systematic biases.

In order to facilitate interpretation of the findings from the systematic review within the autobiographical memory and child witness literatures, each study was classified by parental bias and by whether the findings supported facilitative, misinformation, or non-significant effects of the parent-child discussions on children's subsequent reports. A broad pattern of findings emerged in that facilitative effects often occurred when children discussed experiences with a knowledgeable parent and misinformation effects were frequently observed among studies where parents were misled (Table 4). However, there were exceptions to this general pattern. Significant misinformation effects were not found when exposure to misinformation occurred directly after the event and immediately before the memory interview (Klemfuss et al., 2016; Rush et al., 2017) and under conditions of low levels of parental biases (MacDonald & Hayne, 1996). Facilitative effects were not always found among studies with knowledgeable parents (Chae et al., 2014). In addition, the findings from studies with naïve parents did not produce an interpretable pattern of results (see Table 4).

Notwithstanding, the emerging pattern concerning facilitative and misinformation effects is consistent with the larger autobiographical and child witness memory literatures (Ceci & Bruck, 1993, 2006; Nelson & Fivush, 2004). That is, the collective evidence from the review suggests that discussions with parents who are accurately aware of the details of their children's experiences may bolster children's ability to provide accurate and more complete event reports when later questioned by an unfamiliar adult. According to the sociocultural theory of autobiographical memory development, such discussions strengthen children's memory traces and foster children's understanding of their experiences (Fivush et al., 2006; Nelson & Fivush, 2004; Salmon & Reese, 2015). A large body of literature evaluating associations between mother-child reminiscing and children's memory for *everyday* experiences consistently demonstrates that children's independent reports are facilitated by reminiscing conversations where mothers and children are assumed to discuss events in an accurate manner (Fivush, 2011; Fivush et al., 2006; Nelson & Fivush, 2004). However, the objective accuracy of children's memory is not determined in many of these studies. Such general everyday event discussions may also be important for fostering children's ability to resist misleading questions about a target event during memory interviews (Klemfuss et al., 2016).

In addition, the observation that discussions with misled parents often produced misinformation effects is consistent with similar research evaluating misinformation effects after children discuss experiences with misled unfamiliar adults (for reviews see Ceci & Bruck, 1993, 2006). The observations that such misinformation effects are moderated by the presentation of the suggested information during the parent-child discussion is also consistent with the broader literature (Principe et al., 2013, 2017). That is, questioning techniques that more strongly convey an expected response and interviewer bias tend to result in higher rates of misinformation effects (Ceci & Bruck, 2006). Consistent with the larger source monitoring literature (Johnson et al., 1993), the reviewed findings also demonstrate that misinformation effects occurring from exposure to erroneous information during parent-child discussions may arise from source misattribution errors, especially among preschoolers (Poole & Lindsay, 2002; Principe et al., 2017).

The direct applications of the reviewed findings to the forensic arena need to be couched within the limitations of the existing data. In addition to the limitations addressed within the preceding review, there are more general limitations to this collective body of research. First, as with most analogue research, the broader context of the study designs, including characteristics of the participants and the valence of the target events, are often qualitatively different from the circumstances of forensic investigations. Many of the studies included in our review assessed children's memory for relatively positive experiences, but some studies did include mildly stressful experiences, such as a broken toy (Klemfuss et al., 2016; Rush et al., 2017), a distressing video (Alexander et al., 2010; Warren & Peterson, 2014), a medical procedure (Chae et al., 2014; Goodman et al., 1994), and innocuous touch (Poole & Dickinson, 2011, 2014; Poole & Lindsay, 1995, 2001, 2002). The dynamics and mnemonic consequences of parent-child discussions about traumatic experiences may differ from conversations regarding mildly-stressful and pleasant experiences. Future studies that measure and experimentally manipulate parental belief in their children's experiences (both experienced and nonexperienced events) and parental supportiveness in talking to their children about events that better approximate those to which children testify will greatly advance the field (Malloy & Mungo, 2016). Likewise, research evaluating children's motivations for conversing with their parents and unfamiliar interviewers will be informative.

Furthermore, all of the reviewed studies were conducted among typically developing families. Whether the results of the studies

would generalize among high-risk families and families with histories of child abuse and neglect is unclear. Emerging research indicates that mothers and children from maltreating families discuss everyday past experiences in a less elaborative and less sensitive manner compared with demographically similar dyads from nonmaltreating families (Lawson, Valentino, McDonnell, & Speidel, 2018; Valentino, Comas, Nuttall, & Thomas, 2013). In addition, maltreated children often have expectations that their parents will respond insensitively to their emotional expressions, which may alter the dynamics of parent-child conversations among maltreating families (Shipman & Zeman, 2001). Future research examining parent-child discussions and children's subsequent memory among high-risk families and for experiences that better approximate those that children testify should be a research priority. Lastly, although we identified 23 relevant studies, it is noteworthy that the sample sizes for many of the studies were relatively small. Replication and further empirical evaluation of the current observations is needed to build a more substantial body of work.

Another goal of the current paper is to provide empirically-based recommendations for forensic professionals based on the findings of the systematic review. Our recommendations largely echo and extend recommendations provided elsewhere (e.g., Korkman et al., 2014; O'Donohue et al., 2013; Powell & Lancaster, 2003) and need to be interpreted within the aforementioned limitations of the current state of the empirical evidence. Given the observation that parent-child discussions can have facilitative or misinformation effects depending on the nature of the parent-child conversations and the accuracy of parents' a priori beliefs regarding the events in questions, central questions to examine during forensic investigations where concerns of parental influence arise should include: (1) to what extent did parents have strong biases regarding the events in question before talking to their children, and (2) what was the nature of the conversation(s)? In talking to parents, investigators should assess how parents came to learn about the allegations and whether parents had strong biases regarding the events before talking to their children. Strong biases may be evident when parents indicate that they repeatedly interrogated their child, that their child was reluctant to tell, and that they questioned their child for an extended period of time or over multiple occasions before their child disclosed. However, as reviewed, parents may sometimes question their children in ways that impede children's reports even in the absence of strong biases (Alexander et al., 2010; Sun et al., 2016; Warren & Peterson, 2014). Therefore, the likelihood that earlier parental inquiry may have facilitated or hindered the reliability of children's later reports may not be clear by assessments of parental biases alone.

Identifying who introduced central elements of the allegation during the parent-child discussion can also be important in elucidating whether previous conversations may have bolstered or degraded the reliability of children's forensic reports. Although children and adults often have difficulty recalling specific statements from conversations (both verbatim and gist recall; Bruck, Ceci, & Francoeur, 1999; Lawson & London, 2015, 2017), asking both children and their parents to recount the details of their conversations may provide some information regarding the content of the discussions and the context in which children initially disclosed (Malloy et al., 2013). Questions concerning children's informal disclosures are an integral component of international forensic interviewing protocols (e.g., Steele & National Children's Advocacy Center, 2016; National Child Health and Human Development protocol, Lamb et al., 2007; Newlin et al., 2015). The sensitivity and specificity of alternative hypothesis tests assessing potential parental influence should benefit from gathering as much information as possible regarding the specifics of the parent-child discussions, including the manner in which children's disclosures were elicited.

An additional concern, however, is that adults may misremember the form of their statements and may recount being more open-ended in their approach than they actually were (Bruck et al., 1999; Lamb, Orbach, Sternberg, Hershkowitz, & Horowitz, 2000). Parents may also misattribute information they provided as being initially introduced by their child (Korkman, Laajasalo, Juusola, Uusivuori, & Santtila, 2015). Furthermore, children, especially younger children, may not appreciate the nature of suggestive questions, and therefore, would not be expected to encode or recall high pressure questioning tactics (London, Bruck, Poole, & Melnyk, 2011). Although physical evidence of initial disclosures and succeeding allegation-relevant conversations such as recordings, diaries, and relevant therapy notes may not exist in all cases, evaluating such physical evidence, if it is available, can be crucial given the limitations of memory for conversations. Engaging children in a professional forensic interview shortly after an initial disclosure can help safeguard children's reports from outside influence.

Forensic professionals should be aware of the limitations of the literature and should use caution in directly applying the current observations to forensic contexts. In addition, an appreciation for the nuanced nature of the associations between parent-child discussions and the reliability of children's subsequent event reports is necessary. For example, in the current review, misinformation effects were not found for all children who discussed the event with a misled parent. In addition, children's memory benefited from conversing with their parents under certain circumstances. Determining whether the testimony provided by a particular child may have been facilitated, hindered, or unaffected by discussions with a parent is not a question that science can definitively answer (Goodman et al., 2017). The results from our review suggest that determining whether earlier parental inquiry could have facilitated or contaminated children's reports is extraordinarily complex. Ultimately, in cases where concerns of parental influence arise, evidence regarding parental motives, the content and context of the conversations, and how children's allegations evolved after parental questioning will be critical to address the plausibility that earlier parent-child discussions may have influenced children's allegations.

Declaration of interest

None.

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