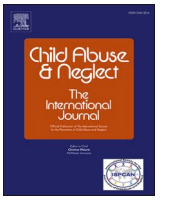
Child Abuse & Neglect 129 (2022) 105639

Contents lists available at ScienceDirect

Child Abuse & Neglect

journal homepage: www.elsevier.com/locate/chiabuneg



Emotional valence and the types of information provided by children in forensic interviews

Yael Karni-Visel [a,*], Irit Hershkowitz [b], Michael E. Lamb [c], Uri Blasbalg [c]

[a] The Louis and Gabi Weisfeld School of Social Work, Bar Ilan University, Israel
[b] University of Haifa, Israel
[c] University of Cambridge, UK

ARTICLE INFO

Keywords:
Child abuse
Support
Emotional language
The Revised NICHD Protocol
Children's eyewitness testimonies

ABSTRACT

Background: Emotions can powerfully affect memory retrieval although this effect has seldom been studied in everyday contexts.
Objective: This study aimed to explore the association between children's verbal emotional expressions and the type of information reported during forensic interviews.
Participants and setting: The sample included 198 interviews with 4- to 14-year-old ($M = 9.36$, $SD = 2.37$) alleged victims of repeated physical abuse perpetrated by family members conducted using the Revised NICHD Protocol which emphasizes a supportive interviewing style.
Methods: Interview videos were transcribed and each conversational turn was coded to reflect the amount and type of children's verbal emotional expressions, forensic information provided, interviewers' demeanor, and type of question asked.
Results: The verbal expression of negative emotions was positively associated with the production of more central details ($\beta = 0.29$, $SE = 0.05$, $p < 0.001$) and peripheral details ($\beta = 0.66$, $SE = 0.07$, $p < 0.001$), while the verbal expression of positive emotions was correlated with peripheral details ($\beta = 0.29$, $SE = 0.15$, $p = 0.047$). The verbal expression of negative emotions was associated with the production of more specific details ($\beta = 0.73$, $SE = 0.06$, $p < 0.001$]) and less generic information ($\beta = -0.39$, $SE = 0.18$, $p = 0.029$) whereas positive emotions were associated only with increased specific information ($\beta = 0.28$, $SE = 0.12$, $p = 0.025$).
Conclusions: These findings highlight how emotional expression, especially of negative emotions, enhances the quantity and quality of children's reports in forensic contexts.

1. Background

Remembering autobiographical episodes involves the processes of encoding information, maintaining it over time, and then retrieving it, namely accessing the information when needed.

Obstacles to remembering autobiographical events may thus represent performance in each of those phases as well as their interdependency with mnemonic functions (e.g. Loftus, Loftus, & Messo, 1987; Tulving, 1983). Cognitive studies have investigated a range of mnemonics, showing the advantage of emotional cues in the retrieval process (e.g. Mather & Sutherland, 2011).

Emotional experiences are remembered in richer detail than non-emotional events by both adults (see Dolcos et al., 2020; Holland

* Corresponding author at: The Louis and Gabi Weisfeld School of Social Work, Bar Ilan University, Ramat Gan, Israel.
E-mail address: yael.karni-visel@biu.ac.il (Y. Karni-Visel).

https://doi.org/10.1016/j.chiabu.2022.105639
Received 17 October 2021; Received in revised form 1 March 2022; Accepted 15 April 2022
Available online 22 April 2022
0145-2134/© 2022 Published by Elsevier Ltd.

& Kensinger, 2010 for reviews; Kensinger, 2009; Mickley Steinmetz, Knight, & Kensinger, 2016) and children (Hamann & Stevens, 2013; see Massol, Vantaggio, & Chainay, 2020; but cf. Van Bergen, Ma, Pratte, & Jehee, 2015). Differences in the extent and quality of children's reports are evident when children recall positive rather than neutral events (Jones & Pipe, 2002), but the effect is especially strong when children recall negative personal experiences (Fivush & Baker-Ward, 2005) such as painful medical treatments (Peterson, 2012), violent and abusive events (Fivush, Hazzard, McDermott Sales, Sarfati, & Brown, 2003; Lamb, Sternberg, & Esplin, 2000; Quas et al., 1999), or natural disasters (Cordón, Pipe, Sayfan, Melinder, & Goodman, 2004).

Researchers have shown that emotions enhance the recollection of emotional events. In the laboratory, emotional cues help children retrieve detailed information about events (Liwag & Stein, 1995; O'Carroll, Dalgleish, Drummond, Dritschel, & Astell, 2006). Liwag and Stein (1995) tested the role of emotional cues including labels, faces and the reinstatement of emotions previously described by their parents, on preschool-aged children's recall of emotional events. They found that all types of emotional cues increased information retrieval, but that reinstatement of the original emotion experienced during the event was most effective. In another laboratory study, O'Carroll et al. (2006) observed a similar effect with 10- to 11-year-olds reporting more specific details than younger children (7- to 8 years old) when emotional cues (consisting of negatively and positively valanced words) were provided. Neurophysiological (Bowen, Kark, & Kensinger, 2018) as well as imaging research (Fenker, Schott, Richardson-Klavehn, Heinze, & Düzel, 2005; Ford & Kensinger, 2016) also suggests neural pathways by which cues as words, pictures, or faces affect memory for episodic contents in adults (see Murty, Ritchey, Adcock, & LaBar, 2010 for review) and children (see Dolcos et al., 2020; Hamann & Stevens, 2013 for reviews).

Not only does emotion enhance the retrieval of information about emotional events, but emotional valence is associated with the type of information reported as well. Whereas negative emotions seem to specifically enhance memory for central details (Buchanan & Lovallo, 2001; Christianson, 1992), positive emotions tend to enhance memory for peripheral details (Talarico, Berntsen, & Rubin, 2009). Loftus, Loftus, and Messo (1987) suggested that negative emotions tend to narrow the focus to central aspects of the event which threaten the individual when experiencing and encoding an event into memory, thereby resulting in better memory for core details than for peripheral or contextual information (Christianson, 1992; Levine & Edelstein, 2009). This phenomenon has been called 'tunnel memory' (Safer, Christianson, Autry, & Österlund, 1998) or a 'memory trade-off effect' (Kensinger, 2009; Kensinger & Schacter, 2007), and has been documented in laboratory studies (Levine & Edelstein, 2009; Massol et al., 2020; Mather, 2007; Rush, Quas, & Yim, 2011) as well as in various real-life settings (for review see Levine & Edelstein, 2009). Specifically, children showed more accurate and lasting memory for central features than peripheral or background features of traumatic experiences such as natural disasters (e.g., Bahrick, Parker, Fivush, & Levitt, 1998(; child sexual abuse (e.g., Alexander et al., 2005), and physical injuries (Peterson & Bell, 1996). Complementary evidence concerning valence-related neural mechanisms suggests that, when stronger and more negative stimuli are presented, a stronger activation of the amygdala facilitates recall of key details rather than peripheral details (Hamann, 2012). Other studies have shown that negative stimuli can enhance memory for peripheral details as well when the events are especially meaningful and salient (Kensinger, Garoff-eaton, & Schacter, 2007; Knight & Mather, 2009; Mickley Steinmetz et al., 2016; Wessel, De Kooy, & Merckelbach, 2000).

In addition to the effect of emotional valence on the centrality of the information remembered, emotions may affect the retrieval of information about discrete instances when repeated events have occurred. When children (and adults) experience many similar events, they tend to form over-generalized representations of typical events rather than specific representations of particular incidents (see Bouyeure & Noulhiane, 2020 for review; Canada, Ngo, Newcombe, Geng, & Riggins, 2019; Hudson & Mayhew, 2008). As a result, they may be able to recall the general gist of recurring events but poorly recall details specific to single occurrences (Brubacher, Malloy, Lamb, & Roberts, 2013; Odegard, Cooper, Lampinen, Reyna, & Brainerd, 2009). In forensic investigations, generic statements are usually not sufficient and the likelihood that a case will proceed to prosecution frequently depends on the specificity with which a child reports discrete instances of the alleged abuse (Guadagno, Powell, & Wright, 2006). Researchers have thus struggled to identify mechanisms which elicit event-specific details during forensic interviews with children who have been repeatedly abused (Brubacher & Earhart, 2019), although studies in which emotional cueing was tested are rare. In their laboratory study, O'Carroll et al. (2006) sought to show the effects of emotional cueing on the amount of specific information (representing event-specific memory) as opposed to generic information reported. They showed that emotional cueing elicited event-specific information, and that the valence of emotions also mattered: Negative emotional cueing was especially effective as children grew older. Complementary imaging studies suggested that emotional arousal triggers stronger activity in the brain region that is critical for pattern separation and thus enables better retrieval of information about separate events (Leal, 2016).

Whereas laboratory analog studies have used external information as emotion-related retrieval cues (Liwag & Stein, 1995; O'Carroll et al., 2006), only self-references to emotions can be used in actual forensic interviews to avoid risky suggestions. However, because many children do not mention emotions when recalling their abuse (Lamb et al., 1997; Lyon, Scurich, Choi, Handmaker, & Blank, 2012; Westcott & Kynan, 2004), researchers have introduced strategies designed to elicit emotional expressions and references to them (Karni-Visel, Hershkowitz, Lamb, & Blasbalg, 2019; Lyon et al., 2012). Recently, Karni-Visel et al. (2019) showed that a supportive interviewing approach using the NICHD Revised Protocol (RP) encouraged children to mention more and more diverse emotions when discussing abusive events; importantly, mentioning emotions was associated with the informativeness of children's statements. However, that study neither distinguished between the valence of the emotions associated with the amount of information retrieved nor the differential association between emotions and various types of information, particularly the types of information that are of critical importance in forensic interviews, namely, event-specific information and central information.

2. The current study

The aim of the current study was to examine whether children's positive and negative emotions, verbally reported when describing abuse in the course of forensic interviews, were differentially associated with the amount of forensically relevant information reported: Central versus peripheral and specific versus generic. Because the types of prompt (open versus close-ended) affect the amount of information reported (Lamb et al., 2003; Orbach et al., 2000), and interviewer supportiveness affects both emotional expressiveness (Karni-Visel et al., 2019) and informativeness (Blasbalg, Hershkowitz, & Karni-Visel, 2018; Blasbalg, Hershkowitz, Lamb, Karni-Visel, & Ahern, 2019; Karni-Visel et al., 2019) these variables were controlled in the current study.

Informed by the literature reviewed above, the following hypotheses were tested:

1. The total number of emotions reported (i.e., both positive and negative) would be positively correlated with the total amount of forensically relevant information although the number of negative emotions would be more strongly associated with the amount of information reported than would the number of positive emotions.
2. The number of negative emotions reported would be correlated with the amount of central information, while the amount of positive emotions would be correlated with increases in the amount of peripheral information.
3. The number of negative emotions reported would be correlated with the amount of specific information, and negatively associated with the amount of generic information reported, whereas neither would be associated with the number of positive emotions reported.

3. Methods

3.1. Sample

The sample comprised 198 children, including 105 boys (53%), who were 4 to 14 years of age ($M = 9.36$, $SD = 2.37$). All children reported repeated physical abuse perpetrated by nuclear family members ($N = 184$; 93%) or other family members ($N = 14$; 7%) in the course of forensic interviews. The abusive acts ranged in severity and were coded in relation to the most severe abuse reported: hitting ($N = 94$; 47.5%), hitting with an object ($N = 63$; 31.8%), and causing serious injuries ($N = 41$; 20.7%).

The interviews were conducted as part of forensic investigations by 41 professional child interviewers from the Ministry of Welfare and Social Services from all regions of XXX during a 20 month-long period (2014–2015(. All interviews were conducted in accordance with the National Institute of Child Health and Human Development (NICHD) Revised Protocol (RP), designed to facilitate both emotional expressiveness and the enhanced retrieval of information about experienced events by children (Hershkowitz et al., 2017; Lamb, Brown, Hershkowitz, Orbach, & Esplin, 2018). Interviews were conducted after a nationwide program in which interviewers were trained to use the RP and thus employ supportive but nonsuggestive strategies throughout the forensic interviews. Interviewers participated in group and individual supervisions in monthly scheduled sessions and received professional feedback on their progress during the training (for more details see Hershkowitz et al., 2017). Specifically, interviewers were trained to provide contingent support in response to the children's expressions of emotions and to prompt for emotions if children did not mention them spontaneously (for more details see Karni-Visel et al., 2019).

To make sure that children were reporting genuine information from memory, only cases which were verified using external evidence (suspect admissions, eyewitness testimony, medical evidence, and/or material evidence, 20%; reports by siblings or other family eyewitnesses, 57%) or based on prior disclosures to professionals (23%), were included. The current study was approved by the Ministry of Welfare and Social Services as well as by the authors' University ethics committee.

3.2. The Revised NICHD Protocol

The NICHD Protocol is a structured interview protocol designed to translate research-based professional recommendations into operational guidelines (Lamb, Hershkowitz, Orbach, & Esplin, 2008) covering all phases of the interview (Lamb et al., 2003; Orbach et al., 2000): Introduction, clarification of the ground rules, rapport building, narrative training, episodic-memory training, and substantive questioning. The guide encourages the interviewer to exhaust the child's memory using free-recall prompting, and only then proceed to directive questions, followed (only if necessary) by option posing questions. Following the SP structure (Orbach et al., 2000), the RP aims to enhance the amount of event-specific information retrieved while minimizing generic information, by instructing interviewers to communicate the need for accounts of specific events and directing children to recount discreet events that are most accessible to memory (for more details see Lamb et al., 2018). For more information regarding the NICHD protocol see https://nichdprotocol.com/).

In addition to these principles, the RP encourages the interviewer to address discomfort and emotions expressed by the children with supportive yet non-suggestive techniques. The guide offers an inventory of non-suggestive supportive statements that can be used as needed by interviewers. In order to encourage emotional discourse in the interview, the RP instructs interviewers to echo and explore all emotions reported (e.g., '[Child's name], you say you were [the emotion expressed]/I hear/see what you are saying/. Tell me more about being [the emotion expressed]'), in the pre-substantive part of the interview, and to prompt for emotions if children do not mention them spontaneously (e.g., 'How did you feel about [an episode reported], [child's name]?'). Interviewers are then guided to use the same techniques during the substantive part of the interviews. In addition, interviewers are encouraged to reply in other supportive ways to emotions by showing appreciation (e.g. 'Thank you [child's name] for sharing your emotions/experiences/with

me, I appreciate that'), encouraging children to share their emotions and experiences by showing overt interest ('I really want to know about your emotions/experiences better, [child's name]'), mentioning the child-interviewer rapport ('You've already told me a lot about your emotions/experiences, [child's name]'), mentioning the availability of the interviewer as a supportive figure ('[Child's name], I am here to understand your emotions/experiences'), providing direct encouragement ('Please tell me more about your emotions/experiences, [child's name]'/'Sometimes children find it difficult to talk at the beginning, but then they succeed'), offering help ('What would help you tell, [child's name]? Would you like to write/draw?') or making small gestures of good will ('Are you comfortable, [child's name]? Would you like a break/A glass of water?').

3.3. Data coding

Interview videos were transcribed and checked to ensure their completeness and accuracy. All analyses focused on the substantive part of the interview during which interviewers asked children to describe the abusive events. Utterance pairs included both the interviewer statement and the child's response. The presence or absence of emotional language was coded when there was a) explicit mention of emotions and emotional states ('I was scared when I saw him coming'); or b) words identifying behavioral displays of emotions ('I cried in my bed'). Emotions were coded as present or absent in each conversational turn and were categorized as either positive (e.g., happy) or negative (e.g., sad) following Wilson, Wiebe, & Hoffmann (2005). In addition, each child utterance was coded for the number of new forensically relevant episodic *details* reported, following a technique first developed by Yuille and Cutshall (1986) and elaborated by Lamb et al. (1996). The details were categorized into two distinct types, first central versus peripheral details and then specific versus generic details. *Central details* were defined as allegation-specific details that are plot-related, specifying the outline of the abusive event (e.g., actions, body parts, objects related to the abuse). *Peripheral details* were defined as descriptive details about the incident, which were not allegation-specific or plot-related (e.g., non-abusive actions, or descriptions of clothing). Details were only counted when they added to understanding of the target incidents, so restatements of facts were not counted. *Generic details* were coded when children provided script-like accounts of what 'usually happens', and *specific details* were coded when children provided information about one particular occasion (see Brubacher, Powell, & Roberts, 2014, for similar coding procedures). Thus, each child utterance was assigned scores for the total number of details, the number of central details, the number peripheral details, the number of specific details, and the number of generic details. Only child's responses that included forensically relevant details were included in the analyses. *Open-ended questions* were coded when interviewers' used invitations and different types of follow up invitations (Hershkowitz, 2001), while *focused questions* included all other types of questions (directive, option-posing). The presence or absence of emotional support in each interviewer utterance was also coded. Indices of *support* included: (1) *encouraging* children to share their emotions and experiences during the event (e.g., 'I really want to know about your emotions/experiences better, [child's name]'); (2) *mentioning* the availability of the interviewer as a supportive figure with whom the child could share his or her emotion (e.g., 'You've already told me a lot about your emotions/experiences, [child's name]'); (3) *exploring* expressed and unexpressed emotions during the event (e.g.'[Child's name], you say you were [the emotion expressed]/I hear/see what you are saying/. Tell me more about being [the emotion expressed]'; and (4) *reinforcements* of the child's effort to explain the feeling during the event (e.g. 'Thank you for your efforts to explain how you felt'). In the current study supportive comments were included only if they were responsive to abuse-related emotions and not to emotions related to the interview context (for more details and examples see Karni-Visel et al., 2019).

Coding was performed by four native speakers of XXX who established inter-rater reliability on a separate set of transcripts prior to coding transcripts for the study. To ensure that good inter-rater reliability was maintained throughout the coding process, 20% of the transcripts were independently coded by two coders. K alpha values for inter-rater agreement (Hayes & Krippendorff, 2007) were 0.82, 0.94, 0.96, 0.86, 0.89, 0.87, 0.86, and 0.80 for emotional support, type of question, emotion type, overall number of details, and numbers of central, peripheral, specific and generic details, respectively.

3.4. Analytic plan

All hypotheses were tested using generalized linear mixed-effects models (GLMM) with SPSS 24 (Hox, 2010). Negative binominal analyses were carried out for the outcome variables (total, central, peripheral, and specific details) whereas binary logistic regression was performed for generic details. Subjects were modeled as random effects (random intercept model) to account for non-modeled child factors. The mixed-effects approach was selected for analyses of the current data because it takes nesting (utterances within child) into account (Hayes, 2006) and handles unbalanced data (such as varying numbers of turns per interview) (Heck, Thomas, & Tabata, 2013). These analyses indicated whether there was significant variability in scores on the dependent variables associated with the independent variables (Level 1 — fixed effects) and at the child level (Level 2 — random effect). Because previous studies found an association between the type of question (open ended versus closed ended questions) and the number of details reported, we added this variable to the current analysis. In addition, because supportive comments were associated with detail production in previous studies (Blasbalg et al., 2018; Blasbalg et al., 2019; Karni-Visel et al., 2019), we included in the model a variable reflecting the presence or absence of supportive comments in each interviewer utterance. The effects of child age, perpetrator identity, and abuse severity were tested in all preliminary analyses. Age and gender were significantly associated with the outcome variables and so were included in subsequent analyses whereas perpetrator identity and abuse severity were not included in the models because their effects were not significant in the preliminary analyses.

4. Results

On average, 2% of the interviewers' utterances provided emotional support (*SD* = 0.16) and 10% of the children's utterances were emotionally expressive (*SD* = 0.28): 2% expressed positive emotions (*SD* = 0.13) and 8% expressed negative emotions (*SD* = 0.27). On average, children's utterances reported 3.96 details (*SD* = 7.81, range = 0–211), of which 2.02 were central (*SD* = 4.12, Range = 0–89) and 1.94 were peripheral (*SD* = 5.52, Range = 0–146) details; 3.65 were specific details (*SD* = 7.64, range = 0–204) and 0.31 were generic (*SD* = 1.80, range = 0–38).

Per interview, children on average reported 273.54 forensic details (*SD* = 205.92, range = 17–1350) of which 139.44 were central (*SD* = 4.12, Range = 11–460) and 134.01 were peripheral (*SD* = 117.88, Range = 0–906) details; 251.44 were specific details (*SD* = 199.86, range = 7–1284) and 22.09 were generic (*SD* = 26.40, range = 0–200).

First, the association between emotional support and emotional language was tested (see Table 1). Supportive interviewer comments were associated with the use of more emotional language by the children (β = 1.79 *SE* = 0.12, $p < 0.001$, 95% *CI* [4.74,7.57]). Child age and gender were also significantly associated with emotional expressiveness: Older children (β = 0.07, *SE* = 0.03, $p = 0.027$, 95% *CI* [1.01,1.13]), and girls (β = 0.59, *SE* = 0.14, $p < 0.001$, 95% *CI* [1.38,2.35]) expressed more emotions than did younger children and boys, respectively.

Second, the associations between the verbal expression of positive and negative emotions and the number of forensic details reported by children were explored (see Table 2).

The number of positive emotional expressions predicted the report of more details overall (β = 0.38, *SE* = 0.12, $p = 0.001$, 95% *CI* [1.16,1.83]) as did the number of negative emotional expressions (β = 0.69, *SE* = 0.06, $p < 0.001$, 95% *CI* [1.78,2.23]). The number of negative emotions predicted more details (in total) than did the number of positive emotions (T score = 3.02 ≥ |1.96|). Child age and gender also had a significant effect (β = 0.04, *SE* = 0.02, $p = 0.006$, 95% *CI* [1.01,1.07]): Older children reported more details than did younger children and girls reported more details than boys did (β = 0.24, *SE* = 0.07, $p = 0.001$, 95% *CI* [1.11,1.46]). Open questions were positively associated with the production of details (β = −0.46, *SE* = 0.08, $p < 0.001$, 95% *CI* [0.53,0.74]), while support was negatively associated with the production of details (β = −0.46, *SE* = 0.08, $p = 0.020$, 95% *CI* [0.53,0.74]).

The associations between the numbers of negative and positive emotional expressions and the number of forensic details of each type reported were then tested. The expression of negative emotions predicted the number of central details reported (β = 0.29, *SE* = 0.05, $p < 0.001$, 95% *CI* [1.21,1.48]) (see Table 3) and girls reported more central details than boys did (β = 0.12, *SE* = 0.06, $p = 0.027$, 95% *CI* [1.01,1.27]). The amount of support expressed had a negative association with the number of central details reported (β = −0.54, *SE* = 0.09, $p < 0.001$, 95% *CI* [0.49,0.69]). The use of open questions was positively correlated with the production of peripheral details (β = 0.47, *SE* = 0.03, $p = 0.001$, 95% *CI* [1.52,1.70]). However, the numbers of positive emotions and age were not significantly associated.

The verbal expression of both positive (β = 0.29, *SE* = 0.15, $p = 0.047$, 95% *CI* [1.00,1.79]) and negative (β = 0.66, *SE* = 0.07, $p < 0.001$, 95% *CI* [1.68,2.24]) emotions were associated with the numbers of peripheral details reported (see Table 4) as was child age (β = 0.04, *SE* = 0.02, $p < 0.001$, 95% *CI* [1.01,1.07]), and gender (β = 0.29, *SE* = 0.08, $p = 0.001$, 95% *CI* [1.15,1.55]): Older children and girls provided more peripheral details than did younger children and boys, respectively. The use of open questions was positively correlated with the production of peripheral details (β = 0.30, *SE* = 0.09, $p = 0.001$, 95% *CI* [1.13,1.60]). However, the association between the numbers of supportive comments and peripheral details was not significant.

The verbal expression of positive (β = 0.28, *SE* = 0.12, $p = 0.025$, 95% *CI* [1.04,1.69]) and negative emotions (β = 0.73, *SE* = 0.06, $p < 0.001$, 95% *CI* [1.85,2.35]) was associated with the production of specific details (see Table 5). However, the number of negative emotions expressed was positively associated with the production of more specific details than was the expression of positive emotions (T score ≥ |1.96|). Child age (β = 0.05, *SE* = 0.02, $p = 0.001$, 95% *CI* [1.02,1.09]) and gender (β = 0.19, *SE* = 0.08, $p = 0.014$, 95% *CI* [1.04,1.40]) also had significant effects: Older children and girls reported more specific details than did younger children and boys, respectively. The use of open questions was positively associated with the production of specific details (β = 0.67, *SE* = 0.039, $p < 0.001$, 95% *CI* [1.84,2.08]). Support was negatively associated with the production of specific details (β = −0.43, *SE* = 0.09, $p < 0.001$, 95% *CI* [0.54,0.78]).

The verbal expression of negative emotions was associated with the production of less generic information (β = −0.39, *SE* = 0.18, $p = 0.029$, 95% *CI* [0.48, 0.96]) (see Table 6) whereas the expression of positive emotions, age, gender, type of question and support were not significantly associated with the production of generic information.

In sum, analyses confirmed that the verbal expression of emotion was associated with indices of the richness of children's recall, especially when negative emotions were expressed. More fine-grained analyses showed that the verbal expression of negative emotions was associated with the production of central but also of peripheral information, whereas the verbal expression of positive emotions was associated with the production of peripheral details only. Positive emotions were correlated with increases in the numbers of

Table 1
Associations between supportive interviewer comments and children's emotional language.

Predictors	B	*SE*	Odds	*p*	95% *CI*
(Intercept)	−3.76	0.30	0.02	<0.001	[0.01,0.04]
Age	0.07	0.03	1.07	0.027	[1.01,1.13]
Gender — girls	0.59	0.14	1.80	<0.001	[1.38,2.35]
Emotional supportive comment	1.79	0.12	5.99	<0.001	[4.74,7.57]

Table 2
Associations between positive and negative emotions and total details.

Predictors	B	*SE*	Odds	*p*	95% *CI*
(Intercept)	0.32	0.15	1.38	0.035	[1.02,1.87]
Age	0.04	0.02	1.04	0.006	[1.01,1.07]
Gender — girls	0.24	0.07	1.27	0.001	[1.11,1.46]
Emotional supportive comment	−0.13	0.05	0.88	0.020	[0.79,0.98]
Open question	0.58	0.03	1.79	<0.001	[1.70,1.90]
Positive verbal emotions	0.38	0.12	1.46	0.001	[1.16,1.83]
Negative verbal emotions	0.69	0.06	1.99	<0.001	[1.78,2.23]

Table 3
Associations between negative and positive emotions and central details.

Predictors	B	*SE*	Odds	*p*	95% *CI*
(Intercept)	0.55	0.12	1.73	<0.001	[1.36, 2.20]
Age	0.02	0.01	1.03	0.134	[0.99,1.04]
Gender — girls	0.12	0.06	1.12	0.027	[1.01,1.27]
Emotional supportive comment	−0.54	0.09	0.58	<0.001	[0.49,0.69]
Open question	0.47	0.03	1.61	<0.001	[1.52,1.70]
Positive verbal emotions	0.10	0.10	1.11	0.320	[0.90,1.36]
Negative verbal emotions	0.29	0.05	1.34	<0.001	[1.21,1.48]

Table 4
Associations between negative and positive emotions and peripheral details.

Predictors	B	*SE*	Odds	*p*	95% *CI*
(Intercept)	−0.39	0.17	0.67	0.019	[0.49,0.94]
Age	0.04	0.02	1.04	<0.001	[1.01,1.07]
Gender — girls	0.29	0.08	1.34	<0.001	[1.15,1.55]
Emotional supportive comment	−0.32	0.12	0.73	0.080	[0.57,0.92]
Open question	1.22	0.04	3.39	<0.001	[3.12,3.67]
Positive verbal emotions	0.29	0.15	1.34	0.047	[1.00,1.79]
Negative verbal emotions	0.66	0.07	1.94	<0.001	[1.68,2.24]

Table 5
Associations between negative and positive emotions and specific details.

Predictors	B	*SE*	Odds	*p*	95% *CI*
(Intercept)	0.07	0.17	1.07	<0.001	[1.84,3.32]
Age	0.05	0.02	1.06	0.001	[1.02,1.09]
Gender — girls	0.19	0.08	1.21	0.014	[1.04,1.40]
Emotional supportive comment	−0.68	0.09	0.50	<0.001	[0.42,0.60]
Open question	0.67	0.03	1.96	<0.001	[1.84,2.08]
Positive verbal emotions	0.28	0.12	1.32	0.025	[1.04,1.69]
Negative verbal emotions	0.73	0.06	2.08	<0.001	[1.85,2.35]

Table 6
Associations between negative and positive emotions and generic details.

Predictors	B	*SE*	Odds	*p*	95% *CI*
(Intercept)	−2.27	0.41	0.10	<0.001	[0.05,0.23]
Age	−0.04	0.04	0.99	0.321	[0.89,1.04]
Gender — girls	0.32	0.19	1.71	0.088	[0.95,1.98]
Emotional supportive comment	0.35	0.24	1.43	0.152	[0.88,2.28]
Open question	−0.11	0.37	0.90	0.769	[0.43, 1.86]
Positive verbal emotions	0.28	0.30	1.32	0.359	[0.73,2.38]
Negative verbal emotions	−0.39	0.18	0.68	0.029	[0.48,0.96]

Table 7
Associations between positive and negative emotions and details — summary of results.

		Type of details				
		All details	Central	Peripheral	Specific	Generic
Valance of emotions	Positive emotions	+	ns	+	+	ns
	Negative emotions	+	+	+	+	−

(+) positive association.
(−) negative association.
(ns) non-significant association.

specific details reported, whereas negative emotions were associated with both increases in the production of specific details and decreases in the production of generic details (see a summary of results in Table 7).

5. Discussion

This study explored the differential connection between positive and negative verbal emotional expressiveness and children's retrieval of forensically valuable information of various types during supportive interviews. Overall, the more emotions were expressed by the children, the more information they provided. Results are consistent with previous findings that reporting emotions in personal narratives is indicative of more intensive processing of the experiences (see Fivush & Baker-Ward, 2005). In addition, the results are consistent with cognitive research (Liwag & Stein, 1995; Tulving, 1983) and imaging studies (Chikazoe & Konishi, 2017; Dolcos et al., 2020; Ford & Kensinger, 2016; Kensinger & Schacter, 2007; McRae et al., 2012; Ofen et al., 2007) showing that emotion retrieval precedes and triggers episodic memory retrieval.

More fine-grained analyses showed the superiority of referring to negative rather than positive emotions, consistent with other evidence that emotional valence can influence the degree of detail with which events are remembered (for review see Kensinger, 2009). Negative information (Bless & Schwarz, 1999; Kensinger et al., 2007) is often remembered in greater detail and more vividly than positive information as a result of the valence-dependent engagement of sensory processes (Kensinger, 2009). Future studies of the associations between the valance of children's emotions and their informativeness when describing neutral or positive events would be beneficial.

The current study focused specifically on the association between emotional valence and the types of information retrieved. As expected, negative emotions were associated with the retrieval of more central information. However, negative emotional language was also associated with increased reports of peripheral information. The association of negative emotions and centrality of information support the 'tunnel memory' model (Safer et al., 1998) and the underlying assumption that negative emotional experiences focus attentional and processing resources on the threatening and central parts of the event (for review see Levine & Edelstein, 2009). However, the association between negative emotions and peripheral details seems to contradict the mentioned previous literature. However, several neuropsychological models (e.g. ABC — Arousal-Biased Competition or GANE — Glutamate Amplifies Noradrenergic Effects Model) (Knight & Mather, 2009; Mickley Steinmetz et al., 2016; Wessel et al., 2000) suggest that, when peripheral information is perceived as salient and meaningful, it is given more attention in the presence of emotions, as happens with central information. Because the to-be-remembered events in the current study involved physical violence toward the children, it is possible that even peripheral details (such as the colour of the suspect's clothing or descriptions of non-abusive aspects of the incidents) were meaningful or threatening, so retrieval of those details was also triggered by negative emotions. It is also possible that negative emotions may have different effects depending on the specific emotion experienced. For example, in one study, fear was associated with better recall of peripheral details whereas anger was associated with better recall of central details (Davis et al., 2011). It is possible that fear was the predominant negative emotion in the current study, thereby enhancing the recall of peripheral information. Future research may benefit from the exploration of discrete emotions and their distinctive effects on memory. In addition, positive emotions were associated with the retrieval of more peripheral details as in previous experimental (Yegiyan & Yonelinas, 2011) and autobiographic research (see Levine & Edelstein, 2009 for review; Talarico et al., 2009).

The use of both positive and negative emotional language was positively associated with the production of specific information, with negative emotions having a stronger connection than positive emotions. Importantly, negative emotional language was associated with the production of less generic information. These data are consistent with previous findings showing that emotions, and specifically negative emotions, facilitate the retrieval of specific visual information (Kensinger et al., 2007) and autobiographic memories (O'Carroll et al., 2006). Moreover, the present study showed a different pattern of findings in relation to generic details. Repeated experiences of stressful experiences may create an emotional barrier that prevents children from freely exploring their memories (Conway & Pleydell-Pearce, 2000). This mechanism known as functional avoidance (see review by Sumner, 2012) leads children to over-generalized memory of repeated experiences (Valentino, Toth, & Cicchetti, 2009). Exploring negative emotions during retrieval may have helped the children overcome their tendency to retrieve generic details and improved the quality of episodic memory retrieval (Yassa & Stark, 2011) such that children who explored their emotions may have used them to direct attention (Bowen et al., 2018) and enabled the efficient top-down scanning process required to move from generalized to specific information (Liu, Graham, & Zorawski, 2008), and extracted episodic details about particular events. This possible explanation is consistent with neuro-physiological finding (Bowen et al., 2018) and imaging research (Leal, 2016; Leal, Tighe, Jones, & Yassa, 2014; Yassa & Stark, 2011).

Children's age was positively associated with the amount of information as well as the amounts of peripheral and specific details recounted. These finding are in line with previous findings demonstrating the developmental progress across childhood in the abilities to provide more details in general (e.g., Lamb et al., 2003) and specific information in particular (see review in Goodman & Melinder, 2007). However, there was no effect for age on reports of peripheral details, consistent with previous findings regarding the type of information that children reported after a natural disaster (Bahrick et al., 1998), yet contrary to findings from research involving alleged victims of sexual abuse in which it was found that older children reported proportionately less peripheral information than did younger children (Hershkowitz & Terner, 2007).

All interviews in the current study were conducted using the RP, which combines evidence-based supportive techniques, including specific emotion-focused techniques such as echoing emotions, acknowledging and exploring them, and empathizing with children's emotions. Interviewers were instructed to support the children throughout the interview, and especially when they were expressing emotions or resistance (Hershkowitz et al., 2017). A recent study showed that use of the RP encouraged children to express their emotions throughout the interview more than in interviews conducted using the Standard Protocol (SP) (Karni-Visel et al., 2019). Interestingly, the numbers of generic details provided by children in the current sample were low relative to previous research (Brubacher & La Rooy, 2014). Because the current study was the first to examine the types of information obtained using the RP, future studies should explore the association between children's emotional expressions and generic information when other interview techniques or groups of children are studied.

The present findings have profound implications for professionals in the forensic field. They make clear that, although children express little emotion when describing abusive events (Katz, Paddon, & Barnetz, 2016), doing so incorporates deep cognitive processing, including the efficient retrieval of valuable information from memory. The results underline the importance of encouraging children to express emotions when being interviewed forensically, despite the inherent difficulty involved.

When children report multiple episodes of abuse, the discussion of emotions in general and negative emotions in particular seems particularly important for the recall of specific events. Obtaining specific information of recurring events remains a challenge for forensic interviewers as researchers have struggled to find ways to facilitate children's accounts of repeated events (Brubacher et al., 2014; Woiwod, Fitzgerald, Sheahan, Price, & Connolly, 2019). In light of the current findings, encouraging children to express their emotions might be a promising technique. Further efforts should be dedicated to developing supportive interviewing techniques to facilitate the use of emotional language when children have difficulty expressing emotions (Peterson & Biggs, 1998).

5.1. Limitations and future research

The current study also has certain limitations. One major limitation stems from the non-experimental design of the current study, which precludes causal inferences. The identified relationships between emotional language and informativeness were correlational in nature and should be interpreted cautiously. However, the predictions and findings of this naturalistic study are consistent with the neurophysiological literature, which has shown that emotions affect memory rather than vice versa (Damasio, 1994). In addition, the data analysis procedures limit the conclusiveness of the findings. First, because emotions were not expressed often, the analyses focused only on their presence or absence in individual utterances. Second, the statistical methods were selected in accordance with the research needs and the nature of the data (hierarchical and low-frequency variables). In such analyses, which use logarithmic transformation, it is not possible to compare the strength of models or to test models with more than one dependent variable. Therefore, some of the hypotheses had to be tested in several analyses, with dependent variables (e.g., central/peripheral details) examined one at a time in separate models. Third, each interviewer's comments were statistically controlled for their type (open/closed-ended) and the presence or absence of support. Future studies should look for the association between the other dimension of the question (e.g., the question's target or specific phrasing) and emotional language or informativeness. Fourth, the lack of information about the length of delay after the abusive events prevented us from examining the age at which the abuse allegedly occurred, and the type of information reported. Fifth, we examined the children's emotional language without regard for nonverbal information, which can be captured by facial expressions and body language. Future research would benefit from a complementary test of the associations between nonverbal expression of emotions and informativeness.

Funding

This research was supported by grants from the Nuffield and Jacobs Foundations, whose generous assistance is gratefully acknowledged. Dr. Uri Blasbalg's work on this paper was supported by the Haruv Institute. For the purpose of open access, the author has applied a Creative Commons Attribution (CC BY) licence to any Author Accepted Manuscript version arising from this submission.

Declaration of competing interest

The authors have no conflict of interest to declare.

Acknowledgments

We would like to thank the youth investigators who made this study possible, and the children whose statements made this study both possible and necessary.

References

Alexander, K. W., Quas, J. A., Goodman, G. S., Ghetti, S., Edelstein, R. S., Redlich, A. D., et al. (2005). Traumatic impact predicts long-term memory for documented child sexual abuse. *Psychological Science, 16*, 33–40.

Bahrick, L. E., Parker, J. F., Fivush, R., & Levitt, M. (1998). The effects of stress on young children's memory for a natural disaster. *Journal of Experimental Psychology: Applied, 4*(4), 308.

Blasbalg, U., Hershkowitz, I., & Karni-Visel, Y. (2018). Support, reluctance, and production in child abuse investigative interviews. *Psychology, Public Policy, and Law, 24*(4), 518–527. https://doi.org/10.1037/law0000183

Blasbalg, U., Hershkowitz, I., Lamb, M. E., Karni-Visel, Y., & Ahern, E. C. (2019). Is interviewer support associated with the reduced reluctance and enhanced informativeness of alleged child abuse victims? *Law and Human Behavior, 43*(2), 156–165. https://doi.org/10.1037/lhb0000303

Bless, H., & Schwarz, N. (1999). Sufficient and necessary conditions in dual-mode models: The case of mood and information processing. In S. Chaiken, & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 423–440). The Guilford Press.

Bouyeure, A., & Noulhiane, M. (2020). Memory: Normative development of memory systems. In A. Gallagher, C. Bulteau, D. Cohen, & J. L. Michaud (Eds.), *Handbook of clinical neurology* (pp. 201–213). Elsevier B.V. https://doi.org/10.1016/B978-0-444-64150-2.00018-6.

Bowen, H. J., Kark, S. M., & Kensinger, E. A. (2018). NEVER forget: Negative emotional valence enhances recapitulation. *Psychonomic Bulletin and Review, 25*(3), 870–891. https://doi.org/10.3758/s13423-017-1313-9

Brubacher, S. P., & Earhart, B. (2019). Investigative interviewing about repeated experiences. In J. J. Dickinson, N. Schreiber Compo, R. Carol, B. L. Schwartz, & M. McCauley (Eds.), *Evidence-based investigative interviewing: Applying cognitive principles* (1st ed., pp. 216–233). Routledge. https://doi.org/10.4324/9781315160276.

Brubacher, S. P., Malloy, L. C., Lamb, M. E., & Roberts, K. P. (2013). How do interviewers and children discuss individual occurrences of alleged repeated abuse in forensic interviews? *Applied Cognitive Psychology, 27*(4), 443–450. https://doi.org/10.1002/acp.2920

Brubacher, S. P., & La Rooy, D. (2014). Witness recall across repeated interviews in a case of repeated abuse. *Child Abuse & Neglect, 38*(2), 202–211.

Brubacher, S. P., Powell, M. B., & Roberts, K. P. (2014). Recommendations for interviewing children about repeated experiences. *Psychology, Public Policy, and Law, 20*(3), 325–335. https://doi.org/10.1037/law0000011

Buchanan, T. W., & Lovallo, W. R. (2001). Enhanced memory for emotional material following stress-level cortisol treatment in humans. *Psychoneuroendocrinology, 26*(3), 307–317. https://doi.org/10.1016/S0306-4530(00)00058-5

Canada, K. L., Ngo, C. T., Newcombe, N. S., Geng, F., & Riggins, T. (2019). It's all in the details: Relations between young children's developing pattern separation abilities and hippocampal subfield volumes. *Cerebral Cortex, 29*(8), 3427–3433. https://doi.org/10.1093/cercor/bhy211

Chikazoe, J., & Konishi, S. (2017). Functional neuroimaging approaches to human memory. In T. Tsukiura, & S. Umeda (Eds.), *Memory in a social context* (pp. 15–24). Springer. https://doi.org/10.1007/978-4-431-56591-8_2.

Christianson, S. A. (1992). Emotional stress and eyewitness memory: A critical review. *Psychological Bulletin, 112*(2), 284–309. https://doi.org/10.1037/0033-2909.112.2.284

Cordón, I. M., Pipe, M. E., Sayfan, L., Melinder, A., & Goodman, G. S. (2004). Memory for traumatic experiences in early childhood. *Developmental Review, 24*(1), 101–132. https://doi.org/10.1016/j.dr.2003.09.003

Damasio, A. R. (1994). Descartes' error and the future of human life. *Scientific American, 271*(4), 144. https://doi.org/10.1038/scientificamerican1094-144

Davis, F. C., Somerville, L. H., Ruberry, E. J., Berry, A. B. L., Shin, L. M., & Whalen, P. J. (2011). A tale of two negatives: Differential memory modulation by threat-related facial expressions. *Emotion, 11*(3), 647–655. https://doi.org/10.1037/a0021625.

Dolcos, F., Katsumi, Y., Moore, M., Berggren, N., de Gelder, B., Derakshan, N., Hamm, A. O., Koster, E. H. W., Ladouceur, C. D., Okon-Singer, H., Pegna, A. J., Richter, T., Schweizer, S., Van den Stock, J., Ventura-Bort, C., Weymar, M., & Dolcos, S. (2020). Neural correlates of emotion-attention interactions: From perception, learning, and memory to social cognition, individual differences, and training interventions. *Neuroscience and Biobehavioral Reviews, 108*(August 2019), 559–601. https://doi.org/10.1016/j.neubiorev.2019.08.017

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review, 107*(2), 261.

Fenker, D. B., Schott, B. H., Richardson-Klavehn, A., Heinze, H. J., & Düzel, E. (2005). Recapitulating emotional context: Activity of amygdala, hippocampus and fusiform cortex during recollection and familiarity. *European Journal of Neuroscience, 21*(7), 1993–1999. https://doi.org/10.1111/j.1460-9568.2005.04033.x

Fivush, R., & Baker-Ward, L. (2005). The search for meaning: Developmental perspectives on internal state language in autobiographical memory. *Journal of Cognition and Development, 6*(4), 455–462. https://doi.org/10.1207/s15327647jcd0604_1.

Fivush, R., Hazzard, A., McDermott Sales, J., Sarfati, D., & Brown, T. (2003). Creating coherence out of chaos? Children's narratives of emotionally positive and negative events. *Applied Cognitive Psychology, 17*(1), 1–19. https://doi.org/10.1002/acp.854

Ford, J. H., & Kensinger, E. A. (2016). Effects of internal and external vividness on hippocampal connectivity during memory retrieval. *Neurobiology of Learning and Memory, 134*(Part A), 78–90. https://doi.org/10.1016/j.nlm.2015.12.007

Goodman, G. S., & Melinder, A. (2007). Child witness research and forensic interviews of young children: A review. *Legal and Criminological Psychology, 12*(1), 1–19. https://doi.org/10.1348/135532506X156620.

Guadagno, B. L., Powell, M. B., & Wright, R. (2006). Police officers' and legal professionals' perceptions regarding how children are, and should be, questioned about repeated abuse. *Psychiatry, Psychology and Law, 13*(2), 251–260. https://doi.org/10.1375/pplt.13.2.251

Hamann, S. (2012). Mapping discrete and dimensional emotions onto the brain: Controversies and consensus. *Trends in Cognitive Sciences, 16*(9), 458–466. https://doi.org/10.1016/j.tics.2012.07.006

Hamann, S., & Stevens, J. S. (2013). Memory for emotional stimuli in development. In P. J. Bauer, & R. Fivush (Eds.), *The Wiley handbook on the development of children's memory* (pp. 724–742). Wiley Blackwell. https://doi.org/10.1002/9781118597705.ch32.

Hayes, A. F. (2006). A primer on multilevel modeling. *Human Communication Research, 32*, 385–410. https://doi.org/10.1111/j.1468-2958.2006.00281.x

Hayes, A. F., & Krippendorff, K. (2007). In *, 1(1). Answering the call for a standard reliability measure for coding data, communication methods and measures* (pp. 77–89). https://doi.org/10.1080/19312450709336664

Heck, R. H., Thomas, S. L., & Tabata, L. N. (2013). *Multilevel and longitudinal modeling with IBM SPSS*. Routledge.

Hershkowitz, I. (2001). Children's responses to open-ended utterances in investigative interviews. *Legal and Criminological Psychology, 6*(1), 49–63. https://doi.org/10.1348/135532501168190.

Hershkowitz, I., Ahern, E. C., Lamb, M. E., Blasbalg, U., Karni-Visel, Y., & Breitman, M. (2017). Changes in interviewers' use of supportive techniques during the revised protocol training. *Applied Cognitive Psychology, 31*(3), 340–350. https://doi.org/10.1002/acp.3333

Hershkowitz, I., & Terner, A. (2007). The effects of repeated interviewing on children's forensic statements of sexual abuse. *Applied Cognitive Psychology: The Official Journal of the Society for Applied Research in Memory and Cognition, 21*(9), 1131–1143.

Holland, A. C., & Kensinger, E. A. (2010). Emotion and autobiographical memory. *Physics of Life Reviews, 7*(1), 88–131. https://doi.org/10.1016/j.plrev.2010.01.006

Hox, J. J. (2010). *Multilevel analysis: Techniques and applications* (2nd ed.). Routledge. https://doi.org/10.4324/9780203852279

Hudson, J. A., & Mayhew, E. M. Y. (2008). The development of memory for recurring events. In M. L. Courage, & N. Cowan (Eds.), *Studies in developmental psychology. The development of memory in infancy and childhood* (2nd ed., pp. 69–91). Psychology Press. https://doi.org/10.4324/9780203934654.

Jones, C. H., & Pipe, M. E. (2002). How quickly do children forget events? A systematic study of children's event reports as a function of delay. *Applied Cognitive Psychology, 16*(7), 755–768. https://doi.org/10.1002/acp.826

Karni-Visel, Y., Hershkowitz, I., Lamb, M. E., & Blasbalg, U. (2019). Facilitating the expression of emotions by alleged victims of child abuse during investigative interviews using the Revised NICHD Protocol. *Child Maltreatment, 24*(3), 310–318. https://doi.org/10.1177/1077559519831382

Katz, C., Paddon, M. J., & Barnetz, Z. (2016). Emotional language used by victims of alleged sexual abuse during forensic investigation. *Journal of Child Sexual Abuse, 25*(3), 243–261. https://doi.org/10.1080/10538712.2016.1137666

Kensinger, E. A. (2009). Remembering the details: Effects of emotion. *Emotion Review, 1*(2), 99–113. https://doi.org/10.1177/1754073908100432

Kensinger, E. A., Garoff-eaton, R. J., & Schacter, D. L. (2007). Effects of emotion on memory specificity: Memory trade-offs elicited by negative visually arousing stimuli. *Journal of Memory and Language, 56*(4), 575–591. https://doi.org/10.1016/j.jml.2006.05.004

Kensinger, E. A., & Schacter, D. L. (2007). Remembering the specific visual details of presented objects: Neuroimaging evidence for effects of emotion. *Neuropsychologia, 45*(13), 2951–2962. https://doi.org/10.1016/j.neuropsychologia.2007.05.024

Knight, M., & Mather, M. (2009). Reconciling findings of emotion-induced memory enhancement and impairment of preceding items. *Emotion, 9*(6), 763–781. https://doi.org/10.1037/a0017281

Lamb, M. E., Brown, D. A., Hershkowitz, I., Orbach, Y., & Esplin, P. W. (2018). *Tell me what happened: Questioning children about abuse*. John Wiley & Sons Inc.

Lamb, M. E., Hershkowitz, I., Orbach, Y., & Esplin, P. W. (2008). What has been achieved: What else needs to be done? (Series Eds.) In G. Davies, & R. Bull (Eds.), *Tell me what happened: Structured investigative interviews of child victims and witnesses* (pp. 267–282). John Wiley & Sons Inc.. https://doi.org/10.1002/9780470773291.

Lamb, M. E., Hershkowitz, I., Sternberg, K. J., Esplin, P. W., Hovav, M., Manor, T., & Yudilevitch, L. (1996). Effects of investigative utterance types on Israeli children's responses. *International Journal of Behavioral Development, 19*(3), 627–637. https://doi.org/10.1080/016502596385721

Lamb, M. E., Sternberg, K. J., & Esplin, P. W. (2000). Effects of age and delay on the amount of information provided by alleged sex abuse victims in investigative interviews. *Child Development, 71*(6), 1586–1596. https://doi.org/10.1111/1467-8624.00250

Lamb, M. E., Sternberg, K. J., Esplin, P. W., Hershkowitz, I., Orbach, Y., & Hovav, M. (1997). Criterion-based content analysis: A field validation study. *Child Abuse & Neglect, 21*(3), 255–264. https://doi.org/10.1016/S0145-2134(96)00170-6

Lamb, M. E., Sternberg, K. J., Orbach, Y., Esplin, P. W., Stewart, H., & Mitchell, S. (2003). Age differences in young children's responses to open-ended invitations in the course of forensic interviews. *Journal of Consulting and Clinical Psychology, 71*(5), 926–934. https://doi.org/10.1037/0022-006X.71.5.926

Leal, S. L. (2016). *Emotional modulation of episodic memory and translational applications to aging and depression-related cognitive impairment*. Doctoral dissertation. John Hopkins University http://jhir.library.jhu.edu/handle/1774.2/40274.

Leal, S. L., Tighe, S. K., Jones, C. K., & Yassa, M. A. (2014). Pattern separation of emotional information in hippocampal dentate and CA3. *Hippocampus, 24*(9), 1146–1155. https://doi.org/10.1002/hipo.22298

Levine, L. J., & Edelstein, R. S. (2009). Emotion and memory narrowing: A review and goal-relevance approach. *Cognition and Emotion, 23*(5), 833–875. https://doi.org/10.1080/02699930902738863

Liwag, M. D., & Stein, N. L. (1995). Children's memory for emotional events: The importance of emotion-related retrieval cues. *Journal of Experimental Child Psychology, 60*(1), 2–31.

Liu, D. L. J., Graham, S., & Zorawski, M. (2008). Enhanced selective memory consolidation following post-learning pleasant and aversive arousal. *Neurobiology of Learning and Memory, 89*(1), 36–46. https://doi.org/10.1016/j.nlm.2007.09.001.

Loftus, E. F., Loftus, G. R., & Messo, J. (1987). Some facts about "weapon focus". *Law and Human Behavior, 11*(1), 55–62. https://doi.org/10.1007/BF01044839

Lyon, T. D., Scurich, N., Choi, K., Handmaker, S., & Blank, R. (2012). "How did you feel?": Increasing child sexual abuse witnesses' production of evaluative information. *Law and Human Behavior, 36*(5), 448–457. https://doi.org/10.1037/h0093986

Massol, S., Vantaggio, S., & Chainay, H. (2020). Emotional modulation of episodic memory in school-age children and adults: Emotional items and their associated contextual details. *Journal of Experimental Psychology: General, 149*(9), 1684–1703. https://doi.org/10.1037/xge0000744

Mather, M. (2007). Emotional arousal and memory binding: An object based framework. *Perspectives on Psychological Science, 2*(1), 33–52. https://doi.org/10.1111/j.1745-6916.2007.00028.x

Mather, M., & Sutherland, M. R. (2011). Arousal-biased competition in perception and memory. *Perspectives on Psychological Science, 6*(2), 114–133.

McRae, K., Gross, J. J., Weber, J., Robertson, E. R., Sokol-Hessner, P., Ray, R. D., Gabrieli, J. D. E., & Ochsner, K. N. (2012). The development of emotion regulation: An fMRI study of cognitive reappraisal in children, adolescents and young adults. *Social Cognitive and Affective Neuroscience, 7*(1), 11–22. https://doi.org/10.1093/scan/nsr093

Mickley Steinmetz, K. R., Knight, A. G., & Kensinger, E. A. (2016). Neutral details associated with emotional events are encoded: Evidence from a cued recall paradigm. *Cognition and Emotion, 30*(7), 1352–1360. https://doi.org/10.1080/02699931.2015.1059317

Murty, V. P., Ritchey, M., Adcock, R. A., & LaBar, K. S. (2010). FMRI studies of successful emotional memory encoding: A quantitative meta-analysis. *Neuropsychologia, 48*(12), 3459–3469. https://doi.org/10.1016/j.neuropsychologia.2010.07.030

O'Carroll, R., Dalgleish, T., Drummond, L. E., Dritschel, B., & Astell, A. (2006). Effects of age, dysphoria, and emotion-focusing on autobiographical memory specificity in children. *Cognition and Emotion, 20*(3–4), 488–505. https://doi.org/10.1080/02699930500341342

Odegard, T. N., Cooper, C. M., Lampinen, J. M., Reyna, V. F., & Brainerd, C. J. (2009). Children's eyewitness memory for multiple real-life events. *Child Development, 80*(6), 1877–1890. https://doi.org/10.1111/j.1467-8624.2009.01373.x

Ofen, N., Kao, Y.-C., Sokol-Hessner, P., Kim, H., Whitfield-Gabrieli, S., & Gabrieli, J. D. E. (2007). Development of the declarative memory system in the human brain. *Nature Neuroscience, 10*(9), 1198–1205. https://doi.org/10.1038/nn1950

Orbach, Y., Hershkowitz, I., Lamb, M. E., Sternberg, K. J., Esplin, P. W., & Horowitz, D. (2000). Assessing the value of structured protocols for forensic interviews of alleged child abuse victims. *Child Abuse and Neglect, 24*(6), 733–752. https://doi.org/10.1016/S0145-2134(00)00137-X

Peterson, C. (2012). Children's autobiographical memories across the years: Forensic implications of childhood amnesia and eyewitness memory for stressful events. *Developmental Review, 32*(3), 287–306. https://doi.org/10.1016/j.dr.2012.06.002

Peterson, C., & Bell, M. (1996). Children's memory for traumatic injury. *Child Development, 67*, 3045–3070. https://doi.org/10.1111/j.1467-8624.1996.tb01902.x.

Peterson, C., & Biggs, M. (1998). Stitches and casts: Emotionality and narrative coherence. *Narrative Inquiry, 8*(1), 51–76. https://doi.org/10.1075/ni.8.1.04pet.

Quas, J. A., Goodman, G. S., Bidrose, S., Pipe, M.-E., Craw, S., & Ablin, D. S. (1999). Emotion and memory: Children's long-term remembering, forgetting, and suggestibility. *Journal of Experimental Child Psychology, 72*(4), 235–270. https://doi.org/10.1006/jecp.1999.2491

Rush, E. B., Quas, J. A., & Yim, I. S. (2011). Memory narrowing in children and adults. *Applied Cognitive Psychology, 25*(6), 841–849. https://doi.org/10.1002/acp.1757

Safer, M. A., Christianson, S. A., Autry, M. W., & Österlund, K. (1998). Tunnel memory for traumatic events. *Applied Cognitive Psychology, 12*(2), 99–117.

Sumner, J. A. (2012). The mechanisms underlying overgeneral autobiographical memory: An evaluative review of evidence for the CaR-FA-X model. *Clinical Psychology Review, 32*(1), 34–48. https://doi.org/10.1016/j.cpr.2011.10.003

Talarico, J. M., Berntsen, D., & Rubin, D. C. (2009). Positive emotions enhance recall of peripheral details. *Cognition and Emotion, 23*(2), 380–398.

Tulving, E. (1983). Elements of episodic memory. Oxford Psychology Series. https://global.oup.com/academic/product/elements-of-episodic-memory-9780198521259?cc=il&lang=en&#.

Valentino, K., Toth, S. L., & Cicchetti, D. (2009). Autobiographical memory functioning among abused, neglected, and nonmaltreated children: The overgeneral memory effect. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 50*(8), 1029–1038. https://doi.org/10.1111/j.1469-7610.2009.02072.x

Van Bergen, R. S., Ma, W. J., Pratte, M. S., & Jehee, J. F. M. (2015). Sensory uncertainty decoded from visual cortex predicts behavior. *Nature Neuroscience, 18*(12), 1728–1730. https://doi.org/10.1038/nn.4150

Wessel, I., De Kooy, P. V., & Merckelbach, H. (2000). Differential recall of central and peripheral details of emotional slides is not a stable phenomenon. *Memory, 8*(2), 95–109. https://doi.org/10.1080/096582100387641

Westcott, H. L., & Kynan, S. (2004). The application of a 'story-telling' framework to investigative interviews for suspected child sexual abuse. *Legal and Criminological Psychology, 9*(1), 37–56. https://doi.org/10.1348/135532504322776843.

Wilson, T., Wiebe, J., & Hoffmann, P. (2005). Recognizing contextual polarity in phrase-level sentiment analysis. In *Proceedings of human language technology conference and conference on empirical methods in natural language processing* (pp. 347–354).

Woiwod, D. M., Fitzgerald, R. J., Sheahan, C. L., Price, H. L., & Connolly, D. A. (2019). A meta-analysis of differences in children's reports of single and repeated events. *Law and Human Behavior, 43*(1), 99–116. https://doi.org/10.1037/lhb0000312

Yassa, M. A., & Stark, C. E. L. (2011). Pattern separation in the hippocampus. *Trends in Neurosciences, 34*(10), 515–525. https://doi.org/10.1016/j.tins.2011.06.006
Yegiyan, N. S., & Yonelinas, A. P. (2011). Encoding details: Positive emotion leads to memory broadening. *Cognition & Emotion, 25*(7), 1255–1262. https://doi.org/10.1080/02699931.2010.540821
Yuille, J. C., & Cutshall, J. L. (1986). A case study of eyewitness memory of a crime. *Journal of Applied Psychology, 71*(2), 291–301. https://doi.org/10.1037/0021-9010.71.2.291