

## Cognition and Neurosciences

# Facilitating particularization of repeated similar events with context-specific cues

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Willén, R. M., Granhag, P. A., Strömwall, L. A. & Fisher, R. P. (2014). Facilitating particularization of repeated similar events with context-specific cues. *Scandinavian Journal of Psychology*.

Ninety-five dental care patients participated in a quasi-experiment in which they were interviewed twice about dental visits they had made during the past ten years. Objective truth was established by analysing their dental records. The main purpose of the study was to investigate to what extent context-specific cues could facilitate particularization (i.e., recollection of events and details) of repeated and similar events. A mixed design was employed and the effects of three types of cues were explored: two types of context-specific cues vs. cues commonly used in police practise when interviewing plaintiffs. In line with our hypothesis, context-specific cues tended to be more effective for recollection of individual events than the comparison cues. In addition, context-specific cues generated more details than the comparison cues and the difference was marginally significant. Rehearsal of the memories by telling them to others was associated with an increased number of recollected events and details. The results are discussed from a legal psychology perspective with focus on recollection of repeated abuse.

*Key words:* Repeated events, source monitoring, investigative interviewing, mnemonics, script theory, cued recall.

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### INTRODUCTION

A plaintiff who has experienced repeated abuse (physical, sexual, or psychological) often provides a vague statement in which there are few events and few details specified. Instead the account is often a general report of how the abuse usually occurred. Unfortunately there are rarely witnesses or physical evidence and the plaintiff's statement is therefore key evidence (Strömwall, 2010). To protect an innocent defendant from being convicted, the courts are consequently recommended to be rigorous on the evidence (NJA, 2010; the statement should e.g., be detailed and not contain incorrect information or contradictions). It is therefore rarely enough that a plaintiff gives general descriptions like "he was often drunk when he hit me" or "sometimes he hit me without any reason." Instead the plaintiff needs to particularize individual events of abuse (Powell, Roberts & Guadagno, 2007). Particularized versions would for instance be: "We had just got home from a party. He was drunk and accused me of having looked at some guys, said he was going to teach me a lesson; pulled the jacket over my face and started hitting me on my back."

Acquittals are common in cases of repeated abuse and many of these cases are closed without legal action because it is such a difficult task to recall repeated events in enough detail (Roberts & Powell, 2001). Research on human memory has provided at least three explanations for why it is difficult to recall repeated events. First, repeated experiences of similar events in general, for example restaurant visits, may cause the development of a "script" (Schank & Abelson, 1977). We remember how they usually occur (the gist), and we are likely to have a very good memory for details that were identical across events (Connolly &

Lindsay, 2001; Powell, Roberts, Ceci & Hembrooke, 1999). We will however face difficulties when asked to recall specific events from the cluster of repeated events (Means, Nigam, Zarrow, Loftus & Donaldson, 1989; Means & Loftus, 1991). Second, it is a challenge to trace the specific source of a certain memory (Johnson, Hashtroudi & Lindsay, 1993). We might recall a glass of wine which tipped over during a dinner with friends, but during which of several dinners did this occur? Third, traumatized individuals often have difficulties providing specific memories about any event, not only memories connected to the actual trauma (overgeneral memory; Williams, Barnhofer, Crane *et al.*, 2007). The incidence of post-traumatic stress among sheltered battered women was over 80% in a study by Kemp, Rawlings and Green (1991) and 30% of women exposed to abuse exhibit symptoms of depression (Sorenson & Golding, 1990). Depression (van Vreeswijk & de Wilde, 2004) and PTSD (Moore & Zoellner, 2007) are commonly associated with an overgeneral memory and it is therefore likely that abused plaintiffs will be constrained cognitively when trying to retrieve specific events or details.

The problems faced for criminal cases of repeated abuse are well known among legal practitioners as well as researchers. Despite this we still lack scientifically based guidelines for how to interview plaintiffs effectively about repeated abuse. Techniques from the Cognitive Interview (CI; Fisher & Geiselman, 1992) are effective to extract detailed and correct accounts about single events (Fisher, 2010). Although cued recall has shown to be effective for particularization (Means *et al.*, 1989; Means & Loftus, 1991), there is still no set of techniques, such as the CI, for separating repeated events from one another. The main purpose of the present study is therefore to contribute to the development of a toolbox for particularization.

## CUED RECALL AS A TOOL FOR PARTICULARIZATION

Cued recall within applied contexts (e.g., CI) has proven to be an effective way of enhancing retrieval with largely maintained accuracy levels (Fisher, 2010), and multiple retrieval cues are more effective than single cues (Gilbert & Fisher, 2006; Tulving & Osler, 1968). Similarly, Schulkind, Rahhal, Klein and Lacher (2012) found that specific cues in the form of short narratives (about 160 words) elicited more specific episodes and actions than categorical cues such as the following three words presented together: “High school – Relationship – Positive.” This finding is in turn supported by the cue overload principle (Watkins & Watkins, 1975) which states that cues with too many associations will be less effective than more specific cues.

There is today a large body of research that in different ways has investigated how children’s recollection of repeated events might be improved. This research was recently summarized by Brubacher, Powell and Roberts (2014) who recommended implementation of several techniques into forensic interviews about repeated events with child witnesses. For instance they recommend that the interviewer asks for the gist before asking for details, enquires about the frequency of abusive acts and whether any events or details were different from the rest. Although not yet tested with adults these techniques might be beneficial for adults as well. In contrast, there seem to be only five studies that have investigated how adults’ memories can be effectively particularized (Cohen & Java, 1995; Leins, Fisher, Pludwinski, Rivard & Robertson, 2014; Means *et al.*, 1989; Means & Loftus, 1991; Philips & Fisher, 1998; Rivard, Fisher, Robertson & Hirn Mueller, 2014). Two of the studies (Leins *et al.*, 2014; Means *et al.*, 1989; Means & Loftus, 1991) tested the effectiveness of interview packages including several different mnemonics, for example the construction of a personal time-line in combination with a cognitive interview and different types of word cues. In contrast to research on mnemonics that may enhance particularization of children’s memories (e.g., Connolly & Gordon, 2014; Gosse & Roberts, 2013; Schneider, Price, Roberts & Hedrick, 2011) only one study (Philips & Fisher, 1998) has examined the effect of an individual mnemonic on adults’ recall. In the unpublished study by Philips and Fisher the effectiveness of context-specific cues that had been derived from individuals sharing the same perspective (hereafter referred to as “derived cues”) was investigated. Which details one encodes during an event is related to the perspective of the encoder (Anderson & Pichert, 1978). To find effective retrieval cues it might therefore be fruitful to search among people who are supposed to have had the same perspective as the rememberer during encoding. Philips and Fisher (1998) did so by asking students what made them recall courses they had taken at the university. Their answers were later presented to a new group of students in form of quotations (e.g., “The teacher was boring,” and “I met my boyfriend during that course”). They found that participants taking part of the derived cues (accurately) remembered more courses than students who only received additional time for recall. Hence, deriving cues from individuals sharing the same perspective might be an effective approach to facilitate particularization of adults’ memories. Derived cues were also employed in the study by Leins *et al.* (2014) who tested the effectiveness of an interview package with several types of

mnemonics. In the present study we extend previous research with adults by examining whether one single mnemonic, derived cues, can facilitate particularization of repeated events.

## THE PRESENT STUDY

The present study examined to what extent derived cues enhance particularization of scripted memories. We compared the effect of two different packages of derived cues: eight derived categories (hereafter called “derived categories”), and the same eight derived categories supplemented with 40 quotations (hereafter called “derived specific cues”). The rationale for this was to explore how detailed the derived cues must be to be effective, which was not investigated by Philips and Fisher (1998). One might argue that any type of relevant cue is more effective for memory retrieval than no cue at all (Tulving, 1974), and Philips and Fisher (1998) found that derived cues were more effective than additional time for recall. We therefore chose a comparison group instead of a control group and presented them with cues inspired by common practise in police interviews (details in the Method section under “Deriving the memory cues”).

In the present study we prioritized ecological validity and establishment of objective truth. The participants recalled dental visits they had made during the past ten years. We chose dental visits as the examined event for two main reasons. First, it enabled us to establish objective truth through dental records. Second, despite the obvious differences between dental visits and abuse, the two types of events do share some important features: There is a direct interaction between two people, including conversations and physical contact, and the patient may experience a lack of control. In addition, both types of events tend to be similar from time to time (i.e., the patient or victim may develop a scripted memory of the event) and both events can occur at any time during the year. The period of ten years was chosen to provide us with a variety of frequency, severity and retention intervals – a variety similar to the diversity in abuse cases.

### *Main hypotheses*

Two measures of particularization were used in this study: How many individual events the respondents recalled and how detailed their memories were. In line with the findings by Philips and Fisher (1998), we predicted that derived cues would generate more individual events (Hypothesis 1a) and more details about the events (Hypothesis 2a) than the cues that are commonly used in police practice.

Since quotations are more specific than categories only, and in line with the cue overload principle (Watkins & Watkins, 1975) and the empirical findings reported by Schulkind *et al.* (2012), we expected that derived specific cues would generate more individual events (Hypothesis 1b) and more details about the events (Hypothesis 2b) than the derived categories.

### *Effects of rehearsal and unpleasantness*

In line with classical research (Linton, 1975), we expected that rehearsal would be positively associated with the participants’

recollections (Hypothesis 3). In line with a review by Christianson (1992) on moderately stressful events, we hypothesized that higher levels of unpleasantness would be associated with better recall of the dental visits (Hypothesis 4).

## METHOD

### Participants and design

**Participants.** Ninety-five individuals (71 women, 24 men) participated.<sup>1</sup> Their mean age was 43.33 years ( $SD = 15.17$ ; range: 24–74 years). Participation was voluntary and each respondent received a gift card valid at stores and restaurants, worth about 28 euro.

Participants were recruited in one of two ways: (1) through advertisements in the waiting room of 20 dental clinics who graciously allowed us access; or (2) by enquiries sent by email to people who had announced interest to participate in research at the Department of Psychology. In addition, dentists and other personnel at some of the 20 clinics we collaborated with verbally informed their patients about the study. The main targets for this verbal information were two groups: patients younger than 30 years (due to initial problems with few interested patients of younger age), and patients who had made 20 dental visits or more during the past ten years. This was to ensure that our sample contained a wide range of participants.

The participants reported having made between six and 60 dental visits ( $M = 17.20$ ,  $SD = 10.29$ ;  $Md = 14.00$ ) during the past ten years, and to have thought about these visits ( $M = 3.15$ ,  $SD = 1.59$ ) and talked about them to others ( $M = 2.87$ ,  $SD = 1.40$ ) to some extent (1 = never, 7 = often). Some found dental visits to be “not at all unpleasant,” while others found them to be “very unpleasant” (1 = not at all, 7 = very), with a mean of 3.15 ( $SD = 2.06$ ).

**Design.** The main study had a mixed design. There were three between-subjects conditions: Derived specific cues vs. Derived categories vs. Comparison cues. In addition, each participant was interviewed twice (within-subjects). Participants were randomly allocated to one of the three conditions with three restraints: We strived for balance between conditions with regard to age, number of dental visits the participants reported having made during the past ten years, and interviewer.

### Procedure

**Deriving the memory cues.** We conducted an initial study in order to derive the cues that were going to be used in the main study. University students ( $n = 27$ ), 27 to 54 years old, answered a short questionnaire in exchange for a lottery ticket worth about 3 euro. They were asked to recall as many dental visits as possible made during the past ten years. For each visit they recalled, they were asked to write down what made them remember that particular visit. We categorized their answers to this latter question using a data-driven thematic analysis. The results are presented in Table 1. The analysis was carried out through discussions by the first author of the present paper and a research assistant. Eight categories were identified (see Table 1). Later, these categories composed the Derived categories condition in the main study.

Subcategories were then created within each of the eight categories, as a preparation for selecting which quotations to use for the Derived specific cues condition (the subcategories were used for this purpose only). Five quotations were selected from each category, and each subcategory was represented at least once. A selected quotation was either a representation of its subcategory or considered to have high associative potential as a memory cue. The selection was made by the first author and the research assistant independently. About 50% of the selected quotations were chosen by both of them. The rest of the quotations were selected through discussions and by consensus from subcategories containing the highest number of quotations. These 40 quotations were then used as cues in the main study for the condition Derived specific cues (see

Table 1. Both conditions of derived cues

Categories	Quotations
Emotions and sense-experiences	<p>“Worried that there would be an invasive procedure”</p> <p>“It was unpleasant and painful”</p> <p>“Afterwards, I had speech difficulties from the anesthesia”</p> <p>“It smelled bad when the dentist drained the tooth”</p> <p>“Afterwards, my mouth felt clean”</p>
Conversations	<p>“I promised the dentist to stop using snuff”</p> <p>“I was instructed how to prevent caries”</p> <p>“As usual, I asked if they could make my teeth whiter”</p> <p>“She said I had bad dental hygiene”</p> <p>“I got calming information”</p>
Times and dates	<p>“The last two times, I had to make several fillings”</p> <p>“I had to come back a couple of weeks after the routine visit”</p> <p>“My birthday was to come”</p> <p>“I usually get a dental recall card around summer time”</p> <p>“It took several visits to fix”</p>
Places and locations	<p>“Met with a specialist in a new department”</p> <p>“It was when I moved to Sweden”</p> <p>“Had to go in emergency to a different clinic than the usual one”</p> <p>“I still lived in my old flat”</p> <p>“First and only time since I moved to Gothenburg”</p>
Personnel	<p>“Heavy-handed dental hygienist”</p> <p>“I noticed the name of the dentist”</p> <p>“New dentist”</p> <p>“My first visit to a dental hygienist”</p> <p>“The dental hygienist was nice, explained well”</p>
Economy	<p>“I had income support from the social services and they were supposed to pay, but it got too expensive so they didn’t want to”</p> <p>“The quality of my teeth was downgraded”</p> <p>“First visit since I had to pay for it”</p> <p>“Cheaper than usual”</p> <p>“I forgot my bank account number and couldn’t sign for a dental insurance”</p>
Treatments	<p>“Impressioning”</p> <p>“It didn’t bleed when the dentist removed the calculus”</p> <p>“Had to sew in the mouth”</p> <p>“She took some x-rays”</p> <p>“The dentist’s drill”</p>
Reasons for visit	<p>“Recommendation from my sister”</p> <p>“Got problem with the same tooth again”</p> <p>“Destroyed a tooth while biting and lost a filling”</p> <p>“I had chipped one tooth”</p> <p>“It was a different reason than usual”</p>

*Notes:* All categories were included in both conditions of derived cues (i.e., Derived categories and Derived specific cues), while the quotations were included only in Derived specific cues. Categories and quotations are translated from Swedish.

Table 1 for all categories and quotations and Fig. 1 for an example of how the cues were presented to the respondents).

For the comparison group, cues were selected through discussions between the first and second author, with the aim of choosing cues that are commonly used for memory enhancing purposes in police interviews



Fig. 1. Example of a card with cues presented to participants. Translated from Swedish.

with plaintiffs and witnesses. Six cues were selected and are presented in Table 2.

**Dental records.** All participants brought their dental records to the experiment. The records were in envelopes sealed by the personnel at the dental clinics to make sure our respondents had not seen the records prior participating. When the experiment was over, the participant her/himself anonymized the records after instructions from the experiment leader. Copies of the anonymized records were used in the study, while the originals files were kept by the participants. A written informed consent form regarding the use of dental records for research purposes was collected from each participant.

**Information to participants.** When arriving at the Department of Psychology, participants were led to the room in which they would stay during the whole experimental session, which in total lasted between 90 and 120 minutes for each respondent. They were informed (in writing and orally) by the experiment leader that the study concerned development of techniques for interviewing plaintiffs who have been repeatedly abused. It was explained to them that the goal of the present study was to examine how people in general remember repeated events. They were informed that they would be interviewed twice and asked to answer two questionnaires. The experimental design (e.g., the conditions) was not known to the participants.

Participants were asked to recall dental visits they had made during the past ten years (between 2002 and 2012). They were instructed to tell about all visits they could recall having made during this period, no matter which clinic it concerned or whether we had access to the dental records or not from that clinic.

Before the first interview, participants were left alone for 5 minutes to prepare by thinking back on the dental visits they had made.

**Interviews.** The interviews were conducted by one of four trained interviewers, who each met with between 19 and 31 respondents, evenly distributed over the three experimental conditions. The same interviewer always held both interviews with a respondent. The interviewers followed a structured interview protocol (see Appendix). Before the interviews started, participants were instructed to avoid guessing, and it was emphasized that they could ask questions at any time during the interview. The length of the first interview was usually around 30 minutes

(participants were told to tell everything they can recall), while the second interview most often lasted about 10–15 minutes (participants were asked for additional information that they had not already told about in the first interview).

**Memory cues.** Between the two interviews, participants were presented with one of the three sets of memory cues. The cues were printed on one card for each category (i.e., 6 or 8 cards) with an instruction to think back and see whether the cue (which was underscored) would help them recall additional information. For example: “Think back at times and dates” and “Think back to the last visit you made.” An example card from the derived specific cues condition is found in Fig. 1. The cards in the other conditions looked the same but were shorter since they had no quotations.

The presentation order of the cards was randomized in three different orders which occurred equally often; each participant within a condition received the cues in one of three orders. In addition, the quotations were presented in one of five different orders.

Participants in the two conditions that had no quotations received 15 minutes alone with the cues, while participants presented with quotations received 20 minutes. The rationale for this was that the latter condition involved a much larger number of cues (6 or 8 cues vs. 48 cues) to process and we wanted to ensure they had enough time to not only read the cues but also time for recollection. In addition, all participants in all conditions were offered five extra minutes. Most respondents were however satisfied after the first 15 or 20 minutes.

The importance of reading each card was emphasized. The participants had access to pen and paper as a support during their recall. They could keep the paper, but not the pen, during the second interview.

**Questionnaires.** After the second and final interview, they were asked to answer two questionnaires. First, they answered a form regarding perceived valence of the memory cues (these results will be presented elsewhere). After finishing the cue form, they continued with a questionnaire concerning demographics and questions on how they had experienced the interview (e.g., comprehensiveness; all scales ranged from 1 to 7).

**Coding procedure.** For referred visits, one research assistant coded all 190 statements (i.e., both statements from each participant) and the corresponding dental records. The number of visits each individual reported (statements) was counted, and how many they actually had made (dental records). Another research assistant conducted the same coding procedure for about 21% of the material (20 randomly selected statements with dental records), independently of the first coder. Intraclass correlations were calculated, showing excellent interrater agreement of 0.98, 95% CI [0.95, 0.99] for the statements, and 0.97, 95% CI [0.94, 0.99] for the dental records.

For type of memory, the coding procedure consisted of three steps. First, all 190 transcripts were broken down in short utterances. This work was inspired by the procedure in Orbach, Lamb, Sternberg, Williams, and Dawoud-Noursi (2001). The workload was shared between two assistants. They followed a written manual (created for this certain purpose by another assistant), and one of the assistants trained the second in how to carry out the procedure. Their work resulted in about 70,000 utterances in total.

Inspired by the procedure employed by Orbach *et al.* (2001), each utterance was in the second step categorized into one of five categories that are commonly employed when measuring overgeneral memory (Autobiographical Memory Test, AMT; Williams & Broadbent, 1986; see e.g., Hargus, Crane, Barnhofer & Williams, 2010). Memory specificity in narratives has shown a positive correlation with the AMT outcome (Sumner, Mineka & McAdams 2013). The five categories were:

- (1) interviewer – questions or responses by the interviewer;
- (2) error – not related to the dental visits or not containing any information (e.g., “I don’t know,” “I can’t say which day it was”);
- (3) categoric – summaries of how something usually or typically occurs (e.g., “because I’m often very dry in my mouth when being stressed”);

Table 2. *The comparison cues*

Cues
The last visit
The second last visit
The first visit
The second visit
Visits that stands out from the others
Visits that co-occurred with a holiday or similar

Note: The cues are translated from Swedish.

- (4) specific – a memory of something particular which lasted less than 1 day (e.g., “they had a trainee there during that visit”); and  
 (5) specific-extended – a memory of something particular which lasted more than 1 day (e.g., “During that period I had a lot of acne”).

One assistant categorized all statements, and a second assistant categorized 21% of the statements. The interviewer category was excluded in the agreement calculations. The interrater reliability was initially not impressive: 0.58 (unweighted Cohen's kappa). Therefore a training session was held with both coders whereafter they both conducted the categorization again and this time reached an acceptable agreement of 0.66, 95% CI [0.65, 0.67].

In the third and final step, each utterance in the three relevant categories (categoric, specific, and specific-extended) was verified through the dental records by two assistants. An utterance could be coded as confirmed, refuted, or unverified. The agreement (based on 21% of the statements; ca. 7,000 utterances) was initially 0.53 (unweighted kappa), and again a training session was therefore held, resulting in a small increase (kappa: 0.58, 95% CI [0.56, 0.60]; 86% agreement). The disagreements concerned the following issues: different interpretations of the dental record's content (e.g., which visit the patient refers to; 61% of the disagreements), different appliance of the coding rules in ambiguous cases (e.g., level of rigidity when a patient emphasizes that s/he is not sure about a certain statement; 27%), different interpretations of a statement (e.g., when a patient use words like “many” or “often”; 8%), typing mistakes (5%). Due to the low kappa coefficient the two assistants worked together with each utterance they disagreed upon until they reached an agreement of 100%. The main coder was instructed to apply their common rules when alone coding the rest of the material.

All dependent variables concerned dental visits made between 2002 and 2012. It should be noted that confirmed referred visits is not equal to visits totally correctly recalled. It only means that the referred visit could be identified in a dental record (i.e., we only verified the visit as a whole; specific details were verified separately). Likewise, unverified referred visits is not equal to refuted visits, since the respondents were encouraged to recall all dental visits they had made, not only visits to clinics from which they had dental records. Referred visits were therefore not coded for refutation. See Table 3 for the descriptive statistics of these variables.

*Data analyses.* When otherwise is not stated, we employed 1-tailed tests for the testing of directed hypotheses and 2-tailed tests for all other calculations. Effect sizes are interpreted through the guidelines suggested by Cohen (1988).

In the present study, number of details was calculated by summarizing specific and specific-extended memories. This was done since both types of memories can be considered specific in legal settings.

## RESULTS

### *Preliminary analyses*

One-way ANOVAs were employed in each preliminary analysis. First, we examined possible differences in the number of referred events in Interview 1 and 2 depending on who had conducted the interview. There was no significant effect of interviewer (Interviewer [I] 1:  $M = 8.00$ ,  $SD = 3.86$ ; I2:  $M = 8.00$ ,  $SD = 3.69$ ; I3:  $M = 7.20$ ,  $SD = 2.83$ ; I4:  $M = 8.79$ ,  $SD = 3.72$ ) on the number of referred events,  $F(3,91) = 0.73$ ,  $p = 0.54$ ,  $\eta^2 = 0.02$ . We repeated the analysis with the summarized number of details in Interview 1 and 2 as the dependent variable. The second interviewer ( $M = 580.70$ ,  $SD = 272.25$ ) extracted significantly more information than the other three interviewers (I1:  $M = 331.61$ ,  $SD = 154.99$ ; I3:  $M = 332.12$ ,  $SD = 201.51$ ; I4:  $M = 385.58$ ,  $SD = 170.16$ ),  $F(3,91) = 7.83$ ,  $p < 0.001$ ,  $\eta^2 = 0.21$  (Post hoc test Bonferroni: all  $ps < 0.01$ ). Participants did however find the interviews very comprehensive regardless of interviewer (seven-point scale: I1:  $M = 6.10$ ,  $SD = 1.45$ ; I2:  $M = 6.40$ ,  $SD = 0.68$ ; I3:  $M = 6.24$ ,  $SD = 0.88$ ; I4:  $M = 6.58$ ,  $SD = 0.61$ ),  $F(3,91) = 0.96$ ,  $p = 0.42$ ,  $\eta^2 = 0.03$ .

There was no significant difference in Interview 1 between the three conditions in terms of number of referred events,  $F(2,92) = 0.78$ ,  $p = 0.46$ ,  $\eta^2 = 0.02$ , or in terms of details,

Table 3. Descriptive statistics for the dependent variables

	Dental records											
	Statements				Confirmed				Refuted			
	Interview 1		Interview 2		Interview 1		Interview 2		Interview 1		Interview 2	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Referred visits	6.44	3.27	1.51	1.49	4.31	2.04	0.87	1.11	-	-	-	-
Type of memory												
Error	89.52	58.75	37.29	23.13	-	-	-	-	-	-	-	-
Categoric	23.65	28.09	7.55	10.06	3.05	4.44	0.55	1.70	0.05	0.27	0.06	0.35
Specific-Extended	60.13	48.14	19.07	19.42	10.37	9.61	1.98	2.73	0.38	0.83	0.09	0.39
Specific	242.64	151.48	67.74	53.38	51.69	28.22	11.56	10.57	2.94	2.72	0.58	1.06
By condition												
Derived spec. cues												
Referred visits	6.94	3.18	1.52	1.75	4.45	2.06	0.77	1.15	-	-	-	-
Details <sup>a</sup>	300.13	176.82	97.97	69.26	65.42	34.12	14.10	10.61	3.71	3.31	0.87	1.41
Derived categories												
Referred visits	5.91	2.82	1.84	1.44	4.31	2.18	1.16	1.25	-	-	-	-
Details <sup>a</sup>	308.31	196.54	89.16	73.64	57.06	33.14	13.97	14.05	2.88	3.02	0.56	0.95
Comparison cues												
Referred visits	6.50	3.77	1.16	1.22	4.16	1.94	0.69	0.90	-	-	-	-
Details <sup>a</sup>	299.78	195.98	73.66	59.65	63.81	32.44	12.56	12.28	3.38	2.49	0.59	1.13

Note: <sup>a</sup> The summarised variable of Specific-Extended and Specific memories.

$F(2,92) = 0.004$ ,  $p = 0.996$ ,  $\eta^2 = 0.00$ . See Table 3 for the descriptives.

#### Objective truth

In Interview 1, 73% of the referred visits were confirmed by the dental records. In Interview 2, 64 participants recalled additional visits and 57% of those visits were confirmed by the records. Not surprisingly, specific memories were more often confirmed by the records than categoric memories: 21 vs. 13% in Interview 1 and 17 vs. 7% in Interview 2, followed by the specific-extended memories of which 17% in Interview 1 were confirmed and 10% in Interview 2. In general, less than 1% of the utterances were refuted by the records, which in part can be explained by our liberal coding of the variable.

A linear regression analysis showed that the number of made visits (as reported in the dental records) increased with age ( $B = 0.50$ ,  $SE B = 0.09$ , 95% CI [0.33, 0.68],  $\beta = 0.52$ ),  $p < 0.001$ ,  $r^2 = 0.27$ .

There was no difference between conditions in Interview 1 with regard to the number of confirmed visits or confirmed details, visits:  $F(2,92) = 0.16$ ,  $p = 0.85$ ,  $\eta^2 = 0.00$ ; details:  $F(2,92) = 0.57$ ,  $p = 0.57$ ,  $\eta^2 = 0.01$ , and there were no differences concerning refuted details in Interview 1,  $F(2,92) = 0.64$ ,  $p = 0.53$ ,  $\eta^2 = 0.01$ . More crucially, neither did any condition produce significantly more or less confirmed visits or confirmed details in Interview 2, visits:  $F(2,92) = 1.62$ ,  $p = 0.20$ ,  $\eta^2 = 0.03$ ; details:  $F(2,92) = 0.15$ ,  $p = 0.86$ ,  $\eta^2 = 0.00$ . Neither were there differences concerning refuted details in Interview 2,  $F(2,92) = 0.65$ ,  $p = 0.52$ ,  $\eta^2 = 0.01$ . Hence, there was no difference between cues concerning the occurrence of memory errors. See Table 3 for all the descriptive statistics.

All referred visits – irrespectively of verification status – form the basis of our analyses. The rationale for this was that all referred events are interesting to legal investigators, although confirmed events give extra strength to the statement.

#### Individual events

We conducted an ANCOVA, with number of reported events in Interview 1 as a covariate, in order to test our first hypothesis that derived cues would generate more events than the cues commonly used in police practice (H1a), and that derived specific cues would generate more events than the derived categories (H1b). Planned contrasts showed that the derived cues (adjusted  $M = 1.68$ ,  $SE = 0.27$ ) tended to generate more visits than the cues used in police practice (adjusted  $M = 1.16$ ,  $SE = 0.26$ ),  $t(92) = -1.62$ ,  $p = 0.055$  (1-tailed),  $r = 0.17$ , 95% CI [-0.04, 0.36]<sup>2</sup>. The difference was marginally significant with a small to medium effect size. There was no significant difference between the two conditions of derived cues,  $t(92) = 0.82$ ,  $p = 0.41$  (2-tailed<sup>3</sup>),  $r = 0.01$ , 95% CI [-0.23, 0.26].

#### Details

Did derived cues result in more details than the comparison cues? We conducted a second ANCOVA, with number of details in Interview 1 as the covariate. Planned comparisons showed

that derived cues (adjusted  $M = 93.31$ ,  $SE = 11.43$ ) generated more details than the comparison cues (adjusted  $M = 74.02$ ,  $SE = 11.34$ ),  $t(92) = -1.39$ ,  $p = 0.08$  (1-tailed),  $r = 0.14$ , 95% CI [-0.06, 0.34]<sup>2</sup>. The difference was marginally significant. Again, the effect size was small to medium. However, there was no significant difference between the two conditions of derived cues,  $t(92) = -0.61$ ,  $p = 0.27$  (1-tailed),  $r = 0.06$ , 95% CI [-0.19, 0.33].

#### Effects of rehearsal and unpleasantness

We conducted two hierarchical regression analyses to test Hypothesis 3 and 4, with the number of referred visits in Interview 1 as the dependent variable in one analysis, and the number of details in Interview 1 as dependent variable in the other analysis. Step 1 consisted of control variables: interviewer, condition, and age. Hypothesis 3 stated that rehearsal would have resulted in an improved memory performance. Two variables, how much the participants had thought and talked about their dental visits, were used as the independent variables to test the prediction (Step 2). The level of unpleasantness was added in the third step.

As hypothesized, rehearsal was a significant predictor of particularization (see Table 4). The significant contribution was mainly by how much the participants had talked about their visits (referred visits:  $B = 0.98$ ,  $p < 0.001$ , 95% CI [0.46, 1.50]; details:  $B = 34.19$ ,  $p = 0.01$ , 95% CI [6.63, 61.74]), while thoughts were relevant to the number of details,  $B = 24.25$ ,  $p = 0.03$ , 95% CI [0.05, 48.45], but not to the number of referred visits,  $B = -0.00$ ,  $p = 0.99$ , 95% CI [-0.46, 0.46].

Partly in line with Hypothesis 4, higher level of unpleasantness predicted more referred visits,  $B = 0.29$ ,  $p = 0.04$ , 95% CI [-0.04, 0.61], while number of details could not be predicted by level of unpleasantness  $B = 4.25$ ,  $p = 0.32$ , 95% CI [-13.16, 21.67]. See Table 4 for more details.

## DISCUSSION

This study examined the effectiveness of derived context-specific cues for particularization of repeated similar events. Additionally we examined how rehearsal of the memories was associated with

Table 4. Hierarchical multiple regression analyses predicting number of referred visits and number of details from rehearsal and unpleasantness

Predictor	Referred visits		Details	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Step 1	0.06		0.20**	
Control variables <sup>a</sup>				
Step 2	0.16***		0.15***	
Thought		-0.00		0.21*
Talked		0.42***		0.26**
Step 3	0.03*		0.00	
Unpleasantness		0.18*		0.05
Total $R^2$	0.25**		0.34***	
$n$	95		95	

Notes: <sup>a</sup> Control variables include condition, interviewer, and age. \* $p \leq 0.05$ , \*\* $p \leq 0.01$ , \*\*\* $p < 0.001$ .

recall; and to what extent the amount of recall was associated with how unpleasant the respondents found dental visits to be. We found promising results regarding the derived cues, and rehearsal and unpleasantness were positively associated to the amount of recall.

#### *The effectiveness of derived cues*

In line with the findings reported by Philips and Fisher (1998), participants taking part of derived cues were to some extent better than the comparison group in recalling individual events and details about the events. This indicates that derived cues might be a valuable mnemonic for use in forensic interviews with adults about repeated events, although further testing is needed.

Our study is the first to compare different levels of specificity in derived cues for the purpose of particularizing adults' memories. Although there were no significant differences between the two conditions of derived cues, an inspection of the absolute numbers suggests that derived specific cues generated somewhat more details about the events than the other types of cues. This is in line with Schulkind *et al.*'s (2012) finding that specific cues gave more detailed responses than categorical cues. However, the absolute numbers also suggest that derived specific cues were somewhat less effective than derived categories concerning recall of individual events. It is possible that the specificity in our derived specific cues stimulates recollection of details effectively, while the categories alone are better suited for prompting individual episodes. Previous research has found that children recall more information if they first are asked questions about the events in general (i.e., about their script memory for the events) and after that receive questions about specific details or episodes (Brubacher, Roberts & Powell, 2012; Connolly & Gordon, 2014). A similar approach may be suitable for the adult witness and for the twofold purpose when interviewing about repeated abuse: to elicit individual events as well as detailed information about the events. This is a possible area for future research, and our results point to the importance of such research being high in statistical power.

It is important to notice that also the comparison cues did enhance recall; presumably because they included specific visits in the phrasing (e.g., "Think back at the last visit you made"). Specific phrasings have shown to elicit specific responding in children (Schneider *et al.*, 2011), and one of the comparison cues asked whether any visits were different from the others which is a recommended question to facilitate children's recall of repeated events (Brubacher *et al.*, 2014). Thus, derived cues showed to be effective even when compared to a relatively strong set of comparison cues. In future research it is important to investigate which combination of cues and mnemonics is the most effective. Critically, the effects of individual mnemonics on adults' recall need to be further examined since they previously only have been tested in packages of several mnemonics (Means *et al.*, 1989; Means & Loftus, 1991; Leins *et al.*, 2014). Further tests of individual mnemonics are therefore an important step towards the development of a toolbox with mnemonics effective for particularization of adults' memories.

One interviewer extracted more details than the other three. This should however not have affected our results since

interviewer was a control variable in all statistical analyses. An interesting result though following from this is that all participants – regardless of who interviewed them – found the interviews equally comprehensive; they all thought of the interviews as "very comprehensive" (a 6 or 7 on a scale from 1–7). This implies that the subjective experience of how much information that was revealed can differ considerably from the objective fact. Applied to legal contexts this supports the notion that there can still be relevant and important information to extract even after the witness states there is nothing more to recall. This is also in line with the literature on reminiscence (Payne, 1987) which has showed that lengthy interviews (as well as repeated interviews) do produce additional recollection (i.e., there is obviously more information to extract). However, delayed recall – especially if it concerns key aspects of an event – can negatively affect legal judgements of credibility and reliability (Oeberst, 2012; UNHCR, 2013). Reminiscence is often considered to be a type of inconsistency (Oeberst, 2012), and inconsistencies is frequently considered to indicate dishonesty (Strömwall, 2010). This legal practise is unfortunate and may be especially harmful to people who have experienced repeated events since they tend to be perceived as less consistent than someone who has experienced a single event (Connolly, Price, Lavoie & Gordon, 2008).

#### *The effects of rehearsal and unpleasantness*

Rehearsal was positively associated with improved recollection of individual dental visits as well as specific details about them. This finding replicates the results from Linton's (1975) diary study, showing that repeated retrieval of events over time lead to increased recall at test four years later. For the present study the effect of thoughts was less prominent than the effect of how much participants had talked about the dental visits to others. Possibly, recollecting an event aloud to someone else may create a stronger memory trace than just thinking about it. The effect of rehearsal by talking to someone seems so strong that it might be a useful factor to take into account when evaluating the reliability of a statement. A plaintiff who states that s/he has talked much about the events could be expected to recall more events and details than someone who states that s/he has not talked to anyone about it.

Furthermore, partly in line with our hypothesis we found that unpleasantness was positively associated with improved recollection. Higher levels of unpleasantness predicted a significant increase of referred dental visits and there was a non-significant increase of details. The second result is somewhat in line with Price and Connolly's (2007) study where no significant difference in number of correctly recalled details was found with regard to whether the children were anxious or not. Their study design did not enable analyses of number of referred visits since there were only four events to remember. It is thus possible that anxiety affects recollection of individual events differently than recollection of details about the events. It should also be noted that unpleasantness is a diffuse measure compared to solid trauma scales and the outcome might had been different if such a measure had been employed instead. However, the present study mainly examined the recollection of repeated events, not traumatic events,

and our findings can be relevant to future predictions of how trauma affects the recall of repeated abuse. We conclude that the current study shows a recollection pattern in line with the literature suggesting that moderate emotional stress improves memory for a single event (Christianson, 1992), although our results indicate that future research should differentiate between recollection of the event itself versus recollection of details about the event.

### Limitations

The current study prioritized ecological validity and establishment of objective truth, which are two of the study's strengths. This was however done on the cost of statistical power since the sample size must be held at a minimum due to limited resources. Future studies on the effectiveness of derived cues should prioritize high power and could do so on the cost of for example ecological validity.

We presented the derived specific cues to participants as they had been originally expressed by participants in the pre-study. Only minor changes were made, for instance by adding a word or two to make it a complete sentence. It is possible that the quotations would have been more effective if they instead had been merged and rephrased so that each quotation was less personal and thereby appealing for more people, without losing its strong connection to the original context. For example, "I promised the dentist to stop using snuff" could have been rephrased to "I made a promise to the dentist that I would take better care of my teeth." That way a possible initial focus on snuff – which most people do not use – could have been eliminated and instead participants' attention would be immediately directed to a certain part of a dialogue that frequently occurs at a dental clinic. Such a procedural change could be employed in future research.

### CONCLUSIONS

The present study suggests that cues derived from individuals who have shared the same perspective as the rememberer during encoding can facilitate particularization of repeated events. Importantly, providing derived cues did not increase the occurrence of memory errors. Future research may profit from examining how different types of cues and mnemonics could be combined, and how they should be presented, to generate an effective toolbox for legal practitioners interviewing adult plaintiffs about repeated abuse.

We would like to thank The Public Dental Care in the Region of Västra Götaland, District South; special thanks to the director Anders Ljungné. In addition, we want to thank the following people: Andreas Aspholmer, Isabelle Hansson, David Lopes, Thérèse Eriksson, Anna-Klara Behlin, Kerstin Adolfsson, Sara Svedlund, and Jenny Rangmar, for coding assistance; Erica Thurang, Maja Jansson, Lukas Jonsson, Anna Krook, and Julia Setterberg, for assistance during the data collection; all assistants who transcribed the interviews; Daniel Berntsson for creative programming; Sara Rangmar, at the Institute of Odontology, University of Gothenburg; and the patients who participated in the study.

This research was financed by The Swedish Crime Victim and Support Authority, and approved by the Regional Ethical Review Board, University of Gothenburg, Sweden.

### NOTES

<sup>1</sup> Initially there were 99 participants but four of them had to be excluded. Two were excluded because they did not bring their dental records, and two were excluded due to mistakes made during the interview by the interviewer.

<sup>2</sup> The same analysis without the covariate showed for individual visits,  $t(92) = 1.63$ ,  $p = 0.05$  (1-tailed),  $r = 0.17$ , 95% CI [-0.03, 0.36], and for details,  $t(92) = 1.35$ ,  $p = 0.09$  (1-tailed),  $r = 0.14$ , 95% CI [-0.06, 0.33].

<sup>3</sup> We report the 2-tailed result here since the results were in the un-predicted direction.

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Received 25 April 2014, accepted 29 September 2014

## APPENDIX: THE INTERVIEW PROTOCOL<sup>1</sup>

### Interview 1

- (1) In total, how many dental visits have you made during the past 10 years? ... And how many of those were at the clinic(s) from which you have got the dental record?
- (2) Okay, now choose one of those dental visits and focus on that... Do you have a specific visit in mind? ... Now tell me – as thoroughly as possible – what you recall from this specific visit.
  - a) Is there anything more you recall from this specific visit? (Tell me...)<sup>2</sup>
  - b) What was the reason for this visit?
  - c) What kind of treatment or procedure did you get during the visit?
  - d) When did the visit take place? (Do you know approximately? What year? What season?)
  - e) Where was it? (Which district? Which clinic?)
  - f) Who treated you? (Which professions did the personnel have? Were they women or men?)
  - g) Is there anything else you recall from this visit?  
[If the participant recalls only one visit, continue to Question 4]
- (3) Okay, let us move on to one of the other dental visits. Choose one of them and focus on that... Do you have a specific visit in mind? ... Now tell me – as thoroughly as possible – what you recall from this specific visit.  
[a to g, as in in Question 2, is asked]  
[Question 3 is repeated until the participant cannot recall any more dental visits]
- (4) Are there any dental visits you recall, that you have not already told me about? [If yes, go back to Question 3 above]

<sup>1</sup> Translated from Swedish. To enhance reading, some written instructions to the interviewer have been excluded in the Appendix (e.g., “await affirmative response from the participant”).

<sup>2</sup> Prompts and questions within parentheses were not told/asked at once; only when needed (i.e., if the participant did not understand the prompt/question, or if the question had not already been answered by the prior question). Prompts and questions were told/asked one at the time, not all at once.

- (5) Okay, is there anything more you remember about the visit(s) you have already told me about? [If no, continue to Question 6]
- Tell me what you remember.
  - Which of the visits does this concern?
  - Do you recall anything else from this specific visit?  
[If yes, go back to Question 5a above]
  - Is there anything more you remember about any other visit? [If yes, go back to Question 5a above]
- (6) Before we take a break, I want to ask you if there is anything else you remember? ... Do you want to add or change anything?

#### Interview 2

- During the break, did you recall any additional visits, which you have not already told me about? [If no, continue to Question 5] How many additional visits do you recall?
- Now choose one of these new visits and focus on that... Do you have a specific visit in mind? ... Now tell me – as thoroughly as possible – what you recall from this specific visit.  
*[From this point, the protocol for Part II is identical to Part I, until Question 6]*
- Before we end the interview, I want to ask you if there is anything else you remember? ... Do you want to add or change anything? ...