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Adult Eyewitness Memory for Single versus Repeated Traumatic Events

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### Abstract

Reports from individuals who have witnessed multiple, similar emotional events may differ from reports from witnesses of only a single event. To test this, we had participants ( $N=65$ ) view a video of a road traffic accident. Half of the participants saw two additional (similar) aversive films. Afterwards, participants filled out the Self-Administered Interview (SAI) on the target film twice with an interval of one week. Participants who saw multiple similar films were less accurate in recalling details from the target film than participants in the control condition. On their second report, participants were less complete but more accurate compared to their first report. These results indicate that adults who have witnessed multiple repeated events may appear less reliable in their reports than adults who have witnessed a single event. These findings are relevant when evaluating eyewitness evidence and call for new approaches to questioning witnesses about repeated events.

*Keywords:* eyewitness memory, reliability, single versus repeated events, eyewitness testimony, Self-Administered Interview

### Introduction

It is well established that eyewitness memory can be unreliable and lack specific details under certain circumstances, especially when the witnessed events are emotional (for a review see Fulero, 2012). This can have dramatic consequences, including misled or inaccurate crime investigations. Moreover, the amount of detail and specificity with which a witness recalls an event is often crucial in decisions about the reliability and credibility of the witness. For example, UK Home Office decision makers are led to expect that the presence of specific details in witness statements signal credibility and can assist in determining refugee status (UK Home Office, 2015). Therefore, research into factors that determine eyewitness reliability is a priority.

An explanatory framework for this line of research is provided by fuzzy trace theory (FTT). It posits that humans can encode and retrieve information at multiple specificity levels and distinguishes two types of mental representations, or memory traces, of a past event. Accordingly, *verbatim* traces are detailed representations of specific information, whereas the *gist* trace lacks specific detail, is based on category and meaning, and is therefore inexact (Brainerd & Reyna, 2002; Koutstaal & Cavandish, 2006). FTT states that verbatim and gist information are processed, stored in memory, and retrieved in a dissociated parallel fashion. As a result, gist and verbatim traces may be available and prone to situational influences to different degrees (Brainerd & Reyna, 2002). People differ in the level of specificity with which information is processed and stored, and hence in the type of trace that is more available for retrieval (Koutstaal & Cavandish, 2006). For eyewitness reports, this implies that the type of trace that is available and being accessed determines the level of detail (Wolfe, Reyna, & Brainerd, 2005).

Several factors may influence the availability and access of gist and verbatim traces. For

instance, over time, verbatim traces are reduced in strength and hence specific details of the event and the surrounding context become less accessible, as compared with gist traces (e.g., Murphy & Shapiro, 1994; Reyna & Brainerd, 1995). Interference is one factor that accounts for reduced accessibility of verbatim traces (e.g., Brainerd, Howe, & Reyna, 1996; Payne, Elie, Blackwell, & Neuschatz, 1996). An important source of interference that may modulate the availability of gist versus verbatim traces is exposure to later events that are similar to the target event. Such repeated similar events can be defined as *a series of events that are conceptually linked and provide expectations about future similar encounters*. Indeed, several studies have demonstrated that the retrieval of verbatim memories is facilitated when the content of an event matches the verbatim information of earlier experiences (e.g., Reyna & Lloyd, 1997). Similarly, gist memories of an event are more likely to be accessed when its semantic content (e.g., the underlying meaning) matches with other past experiences (e.g., Wolfe et al., 2005). Thus, repeated similar experiences that differ in verbatim information may strengthen gist traces in memory, while verbatim traces become less available.

It follows from this that witnesses of repeated similar events might be less reliable than witnesses of single events, as reflected in lower accuracy, completeness, and consistency (see Smeets, Candel, & Merckelbach, 2004). For instance, increased reliance on gist traces might undermine their reporting accuracy, which refers to the proportion of correctly stated information and incorrect information such as distortions (i.e., a major detail change of an existing element) and commission errors (i.e., introduction of a completely new element; Gudjonsson & Clare, 1995). Moreover, the completeness of recall, that is the total amount of information reported, may be compromised by omission errors. Finally, witnesses of repeated events might provide less consistent reports across multiple recall sessions. Assuming there is interference from recall

of similar events, the details that are provided about a single event may change across repeated interviews (i.e., there may be omission errors or contradictions in the details reported across different interviews; Smeets, Candel, & Merckelbach, 2004).

In child witnesses, several studies have looked at recall of repeated events and found that memory for repeated similar events was characterised by stronger reliance on gist representations compared with incident-specific recall. Brubacher, Roberts, and Powell (2012) asked children (aged 4-8 years) to recall a single play activity session or four play sessions that took place over a 2-week period. They found an age related increase in generic references when children were questioned about the repeated sessions. In line with this laboratory research, a study among victims of childhood sexual abuse found that those who had suffered repeated abuse reported fewer episodic (instance specific) details and more general information compared to victims of a single abusive event (Schneider, Price, Roberts, & Hedrick, 2011). Moreover, source misattributions frequently occur when children recount multiple occurrences of an event (Connolly & Price 2006; Powell & Thomson, 1996). Connolly, Price, Lavoie, and Gordon (2008) had participants watch video recordings of children describing the same event and rated the children's credibility. For half of the children, the event had been experienced once, and for the other half, the event was last in a series of similar events. Although all children were similarly accurate, repeated-event children were judged to be less credible than the single-event children. An analysis of the content of the reports revealed that most of the variability in credibility ratings could be attributed to differences in consistency between single- and repeated-event reports.

To summarize so far, a review of theory and research with child witnesses leads us to expect recall of repeated events to rely on a general event representation in line with FTT.

However, almost all the relevant work is limited to a small number of studies of children. We simply do not know enough about memory for repeated events in adults to draw the same conclusions with confidence.

With the aim of examining the effects of witnessing single versus repeated events on eyewitness memory, we exposed healthy adult participants to a target film of a devastating car crash and had them fill out a Self-Administered Interview (SAI; Gabbert, Hope, & Fisher, 2009) on details of the film in two separate sessions. Crucially, in one group the target film was preceded by neutral unrelated films (single-event condition), whereas in another group the target film was preceded by similar shocking films (repeated-event condition). To assess the reliability of the testimonies, we focused on report accuracy, completeness, and consistency (see Smeets, Candel, & Merckelbach, 2004). Drawing on FTT, we expected participants in the repeated-event condition to provide less reliable testimonies, as indicated by poorer accuracy, completeness, and consistency across two reporting sessions. In addition, we expected participants to be less complete in their second report session compared to their first report session.

## **Method**

### **Design**

Participants were randomly assigned to one of two conditions. The experimental design is shown in Table 1. The between subjects-variable was condition (*single, repeated events*) and the within-subjects variable was time (*report session one, two*). The dependent variables were report accuracy, completeness, and inconsistency, which were measured over the two repeated test sessions during which eyewitnesses answered questions about the witnessed event(s).

Table 1

*Design*

<i>Session</i>	<i>Time delay</i>	<i>Single-event condition</i>	<i>Repeated-event condition</i>
1		Neutral film	Trauma film
2	<i>Three successive days</i>	Neutral film	Trauma film
3		Target trauma film	Target trauma film
4	<i>5-9 days after session 3</i>	First report session	First report session
5	<i>6-8 days after session 4</i>	Second report session	Second report session

**Participants**

Sixty-five adult students (51 women) within the age range of 18-35 years ( $M=19.5$ ,  $SD=2.58$ ) were recruited from Royal Holloway University of London. Participants were randomly assigned to the single-event ( $n=32$ ) or repeated-event condition ( $n=33$ ). As an inclusion criterion, all participants were required to be proficient English speakers. The exclusion criteria were current psychological or psychiatric problems, a history of traumatic experiences (including severe road accidents), fear of seeing blood, and pregnancy. To establish the inclusion- and exclusion criteria, we relied on the participants' self-report. For this study, participants could earn study credits or enter a lottery to win a 25 pound Amazon voucher. This study was reviewed and approved by the Psychology Department ethics committee at Royal Holloway University of London.

**Material**

**Films.** To resemble real-life eyewitness memory, we used the stressful film paradigm

(Lazarus, Opton, Nomikos, & Rankin, 1965) in which participants watch trauma film segments. The trauma films contained footage of the aftermath of road traffic accidents, which displayed graphic horrific images such as injuries, dead bodies, and victims in distress. Duration lengths of all films in this study were approximately 02:43 minutes. The target film consisted of staged footage of the aftermath of a severe multiple car crash involving eight victims. Among the victims were three female students, two of whom died while one was severely injured. Two drivers of other cars died before they could be taken to hospital. Two young children sat in the backseat and were physically unharmed but in shock. Some of the displayed scenes were graphic and shown in full detail. This film was well suited for the purpose of this study, as it was rich in distinctive features such as multiple victims of varying age, rescue helicopters, and short dialogues. Prior studies have successfully used this material to induce negative affect and aversive memories (Meyer et al., 2014; Meyer et al., 2013).

In the repeated-event condition, two additional aversive films were shown before the target film. These films were two compilations of real-life footage from the aftermath of road traffic accidents that have been used by Steil (1996) and others (e.g., Brewin & Saunders, 2001; Holmes, Brewin, & Hennessy, 2004). The films were chosen such that their content closely matched with each other (i.e., depicting corpses and injuries, victims in distress, and emergency service personnel working to extract trapped victims), and their graphic aversive details were shown in a similar fashion. They, therefore, well fitted our definition of repeated events. In the single-event condition, two neutral, unrelated films were shown to participants prior to the target film. Both consisted of fragments from a documentary about glass blowing. Because of ethical concerns related to the emotionally provoking material shown to participants, we encouraged participants to contact the experimenter or student counselling at Royal Holloway at any stage



during the study if they experienced any distress. However, no participant reported on-going distress to the experimenter. Any contact of the participants to the counselling services after the study was treated as confidential and therefore could not be ascertained.

**The Self-Administered Interview.** The Self-Administered Interview (SAI; Gabbert, Hope, & Fisher, 2009) is a recall tool used for the acquisition of eyewitness reports from different types of crime. It arose out of the Cognitive Interview, which is a memory based procedure designed to maximise the amount of recalled information through engagement in effective search and retrieval processes (Fisher & Geiselman, 1992; Memon, Meissner, & Fraser, 2010). The original SAI contains seven sections of information and instructions aimed to facilitate the self-report and recall of the witnessed event, and has been shown to efficiently and effectively elicit detailed and accurate accounts of a witnessed event (Gabbert, Hope, & Fisher, 2009). For this study, we used a modified computer-administered version of the SAI that contained a mental context reinstatement section, followed by four report sections. The first report section required participants to report everything they could remember about the event and the people that were involved. In the next three report sections, participants were asked to report on the appearance of the people, vehicles, and distinctive objects that were observed in the event, respectively. This included estimating the number of people involved in the accident, vehicles, and objects, before describing each in detail.

**The Depression Anxiety Stress Scales 21.** The 21-item version of the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995) is a brief self-report questionnaire consisting of three 7-item scales that assess depression, anxiety, and stress, respectively. Each item reflects a short statement on which participants have to indicate how it applied to them over the past week using a 4-point scale (1= *Did not apply to me at all*; 4=

*Applied to me very much, or most of the time*). To derive a DASS-21 total score, we summed all items ( $\alpha = .87$ ) and multiplied the result by 2, making the scores comparable to the longer 42-items version. We used the total score to check for baseline differences between conditions in general psychological distress (Henry & Crawford, 2005).

**The Positive and Negative Affect Schedule.** The Positive and Negative Affect Schedule, state version (PANAS; Watson, Clark, & Tellegen, 1988) is a short self-report questionnaire that measures two dimensions of mood, namely Positive Affect (PA) and Negative Affect (NA), on two 10 item subscales. Each item describes a feeling or emotion, and participants have to rate the extent that the item applies to them in that moment. Answer options range from 1 (*very slightly or not at all*) to 5 (*very much*). In this study, we used the NA subscale (all  $\alpha$ s > .84) to measure affective responses to viewing the stimulus films.

### **Procedure**

Participants were invited to five individual sessions. The first three sessions took place in a sound-attenuated testing room on three successive days. At first, participants gave informed consent and filled out the DASS-21. In the first three sessions, they viewed the assigned films (see Table 1) and filled out a PANAS before and directly afterwards. All films were displayed on computer screens. Participants used headphones to avoid distraction caused by background noise, and to increase immersion in the shown films. The fourth session took place within a period of five to nine days after the third session. The length of this period was established to increase ecological validity. In this session, participants filled out the modified SAI on the laboratory computer. Detailed instructions were provided on the computer screen, and participants were asked to spend at least 25 minutes for the first report section of the SAI. Before reporting, the experimenter ensured that participants understood the instructions. After a

delay of six to eight days, the fifth session took place. In this session, participants reported on the target film for a second time by filling out an identical SAI to the one they were given the first time. This SAI was completed digitally at home with the same instructions. Lastly, participants were debriefed, thanked, and compensated for their participation.

### **Coding**

Two independent coders viewed the target film and coded as many units of information (UOI) as they could observe. UOIs were defined as sentences and parts of information that are independent of all other information units. For example, *'the woman with long blond hair'* consists of three independent units of information, namely: *'woman'*, *'long hair'*, and *'blond hair'*. The coders evaluated each other's UOIs by indicating agreement or disagreement. Because each coder had to evaluate a different list constructed by the other coder, inter-rater agreement ratios (number of agreements / number of agreements + disagreements) rather than Kappa were used to assess reliability, revealing satisfactory agreement ratios of .94 and .83. A coding sheet was then constructed which included all UOIs that the coders had agreed on. In total, 683 UOIs were included, divided over the following sections: *General* (27), *Actions* (78), *People* (431), *Vehicles* (108), and *Objects* (39). For every participant, we added all additional UOIs that they reported to this list. Next, all participants' reports were scored for reported UOIs and coded for correctness, distortion, and commission. This was carried out by one coder, using a coding manual and the constructed coding sheet (see Appendix A). A score of '1' was given if units were correctly reported and a score of '0' was given if not. The same scoring allocation was applied for the distortion and commission variables.

An accuracy index was also calculated for each participant by dividing the number of correctly reported details by the sum of correct details, distortions, and commissions.

Completeness was calculated by summing all reported UOIs. Inconsistency was calculated by comparing each participants' first and second accounts with each other. This was done by summing direct discrepancies, the number of additions, and the number of omissions in the second report, relative to the first report, yielding an inconsistency score. In addition, 20% ( $n=28$ ) of the participants' reports were coded by the second coder to assess intercoder reliability. For accuracy, intercoder reliability was calculated by averaging the ratio between agreement and disagreement per participant over all 28 reports and information categories. For completeness and inconsistency, each coder's completeness and inconsistency scores were standardized across participants with a  $z$ -transformation. Absolute differences between the two  $z$ -scores of each participant were then averaged over all participants. This yielded inter-coder disagreements for accuracy, completeness, and inconsistency of .17, .17, and .25, respectively.

### **Statistical Analyses**

For our main analyses on accuracy, completeness, and inconsistency scores, we performed 2 (report session: first, second)  $\times$  2 (condition: single-event, repeated-event) mixed-design ANOVAs. Main and interaction effects were then tested by means of  $t$ -tests. Similarly, the analyses of baseline group differences and mood responses relied on ANOVAs and  $t$ -tests. Time interval variations between sessions three and four, four and five, and three and five were included in the analysis as covariates. For all tests, a  $p$ -value  $<.05$  (two-tailed) was considered statistically significant.

## **Results**

### **Group Differences at Baseline**

An independent samples  $t$ -test revealed no significant difference of age between conditions,  $t(63)=1.313$ ,  $p=.197$ . A chi-square test revealed no significant differences in the

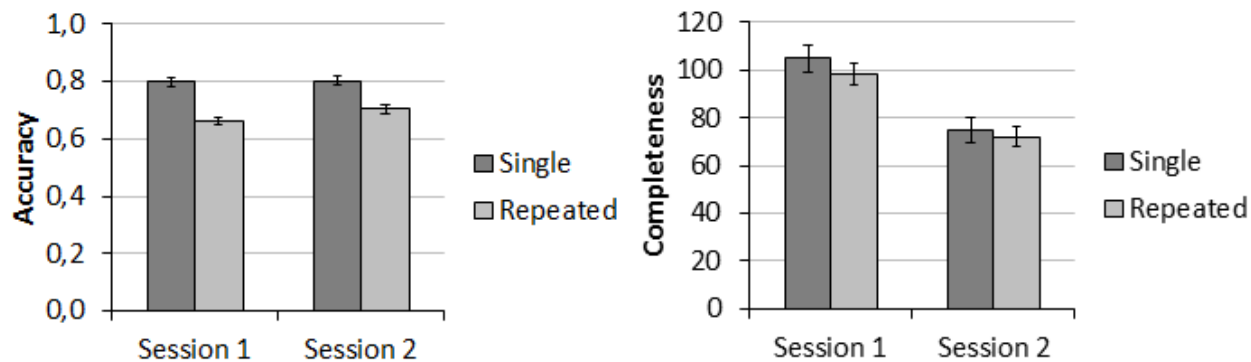
distribution of sex between conditions,  $\chi^2(1, N=65)=1.618, p=.20$ . For all participants, total DASS-21 scores were within the normal non-clinical range ( $M=17.38, SD=12.91$ ; Henry & Crawford, 2005). An independent samples  $t$ -test revealed no significant difference of DASS-21 scores between conditions,  $t(63)=1.480, p=.14$ .

### **Mood Responses to Films**

A 3 (film session: first, second, third)  $\times$  2 (time: pre-film, post-film)  $\times$  2 (condition: single-event, repeated-event) mixed-design ANOVA on PANAS-NA scores revealed a significant three-way interaction,  $F(2,62)=6.615, p<.01, \eta p^2=.176$ . Paired samples  $t$ -tests revealed that PANAS-NA scores increased from pre- to post-film for the repeated-event condition in the first,  $t(33)=5.34, p<.001$ , second,  $t=4.64, p<.001$ , and third session,  $t=5.69, p<.001$ . Meanwhile, for the single-event condition, PANAS-NA increased significantly only in the third (target film) session,  $t(32)=6.24, p<.001$ , but not in the first two sessions,  $ps>.26$ . In the third session, the difference score from pre- to post-film PANAS-NA did not differ between the two conditions,  $t(63)=-.424, p=.67$ .<sup>1</sup> In the third session, PANAS-NA post film scores between the single-event condition and the repeated-event condition did not differ significantly.

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<sup>1</sup> DASS-21 scores at baseline and PANAS-NA increase in session 3 did not correlate with accuracy and inconsistency scores (all Pearson's  $r<.21, p>.101$ ). Only completeness in the second reporting session correlated negatively with NA increase,  $r=-.29, p=.029$ . However, including PANAS-NA increase as a covariate did not substantially change the results or alter the conclusions in the following analyses on completeness.



**Fig. 1.** Mean accuracy and completeness values for the single event condition and the repeated event condition across the two report sessions. The single event condition displayed higher accuracy scores than the repeated event condition in both report sessions. A trend-level interaction ( $p = .051$ ) suggests that accuracy increases over time, but only in the repeated event condition. Mean completeness values were significantly lower in the second compared to the first report session, irrespective of condition. Error bars indicate standard error of the means.

### Reliability Indicators

In Figure 1, accuracy and completeness results are displayed for the single-event condition and the repeated-event condition over the two report sessions. A 2 (report session: first, second)  $\times$  2 (condition: single-event, repeated-event) mixed-design ANOVA on accuracy scores revealed a main effect of condition,  $F(1,54)=36.52$ ,  $p<.001$ ,  $\eta p2=.403$ , with significantly higher accuracy in the single-event condition than in the repeated-event condition.<sup>2</sup> In addition, a main effect of report session was revealed,  $F(1,54)=6.37$ ,  $p=.015$ ,  $\eta p2=.106$ , with more accurate reports in the second compared to the first report session.<sup>3</sup> There also was a trend-

<sup>2</sup> Separate analyses for each of the accuracy parameters revealed that significantly more correct details,  $F(1,54)=9.294$ ,  $p<.01$ ,  $\eta p2=.147$ , and fewer commissions,  $F(1,54)=25.14$ ,  $p<.001$ ,  $\eta p2=.318$ , were reported on the target film in the single-event condition, compared to the repeated-event condition.

<sup>3</sup> Significantly fewer correct details  $F(1,54)=69.71$ ,  $p<.001$ ,  $\eta p2=.564$ , fewer distortions  $F(1,54)=25.04$ ,  $p<.001$ ,  $\eta p2=.317$ , and fewer commissions,  $F(1,54)=12.676$ ,  $p<.01$ ,  $\eta p2=.190$ , were reported on the target film in the second compared to the first report session. Since overall accuracy increased across sessions, these findings

significant interaction between Condition and Report Session,  $F(1,54)=3.97, p=.051, \eta p^2=.069$ . Paired samples  $t$ -tests showed that this was a result of a significant increase in accuracy between the two report sessions for the repeated-event condition  $t(26)=-2.56, p=.017$ , which was not found for the single-event condition,  $t(28)=-.52, p=.61$ . For completeness and inconsistency, the predicted main effects of condition were not significant, all  $F_s < 63, p_s > .43$ . There also were no interaction effects, all  $F_s < .27, p_s > .61$ . For completeness, the mixed-design ANOVA only revealed a main effect of report session,  $F(1,54)=63.09, p < .001, \eta p^2=.539$ . Participants in both conditions produced less complete reports on the target film in the second compared to the first report session. Time interval as a covariate did not lead to any differences in our results. All other main effects and interactions were non-significant and/or irrelevant to our hypotheses, all  $F \leq .624, p \geq .433, \eta p^2 \leq .011$ .

### Discussion

This study investigated whether there are differences in accuracy, completeness, and inconsistency in adults who have witnessed similar, repeated traumatic events compared to adults who have witnessed only one traumatic event. We found that adults who are shown multiple films of traumatic scenes from a car accident were less accurate in their reports compared to participants who saw a neutral film. In addition, the reports in both conditions were less complete, yet more accurate, in their second report session compared to their first report session. This increase in accuracy (mainly driven by decreases in distortions and commissions) was more pronounced in the repeated-event condition. These results suggest that adults who have witnessed repeated, similar traumatic events are less accurate, and thus potentially less

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indicate that the number of correctly reported details decreased proportionally less than the number of distortions and commissions.

reliable witnesses, than adults who have only witnessed a single traumatic event.

These results fit with our expectations. That is, FTT would predict that participants in the repeated-event condition would rely more on (erroneous) gist traces that are based on similar experiences, and less on verbatim traces from the target film, leading to less accurate reports (Wolfe et al., 2005; Reyna & Brainerd, 1995; Schneider et al., 2011). Contrary to expectation there were no differences between groups in completeness and inconsistency, suggesting that the effects of exposure to repeated negative events are limited to report accuracy. To our knowledge, the present study is the first to explore the impact of repeated emotional experiences on memory completeness and consistency in adults. In children, prior studies on non-emotional memory found either no effects, or lower consistency for multiple similar events compared to a single event (Connolly et al., 2008; Schneider et al., 2011). However, unlike the free-report method we used, these authors tested memory for specific, non-emotional details using cued recall. Thus, it remains to be determined whether these differences can be attributed to the effects of age, reporting method, and/or emotionality of the memories.

The reduced completeness of reports in the second session compared to the first was likely due to forgetting over time (Wixted & Ebbesen, 1991; but see Campbell, Nadel, Duke, & Ryan, 2011). Consistent with this observation, the SAI has been shown to boost detail memory initially, followed by a drop in the number of correct details within a one-week interval (Krix, Sauerland, Gabbert, & Hope, 2014). The difference in completeness between the two report sessions could also be explained by motivational differences. During the second (home) report session, participants did not have an experimenter present to ensure participants continued typing until they reached the instructed minimum typing time. We were also unable to control for distractions that may have occurred during the at-home report session; consequently, the at-home



session may have differed from the lab-based session (e.g., Barenboym, Wurm, & Cano, 2010). Hence motivational differences might explain a shift in criterion, leading to less complete, yet more accurate reports at session two. This explanation would reconcile our results with prior findings suggesting that false memories (of words) are stable over time (e.g., Toglia, 1999), whereas here we found decreases in distortions and commissions between the sessions. One advantage of our design was that report session was a within-subjects variable and both single- and repeated-event conditions completed the second session at home thereby providing a useful estimation of how SAI reports compared at the two time points in terms of accuracy and completeness. However, further investigation is needed to shed light on the complex relationship between testing environment, repeated testing and changes in the quality of memory reports over time.

As intended, the trauma films successfully induced negative emotional states, as evidenced by significant increases in PANAS-NA scores following the aversive (but not the neutral) films. Importantly, NA scores increased similarly in both conditions in response to the target film, which indicates that our findings cannot be attributed to differential emotional impact of the target film in both conditions. Still, one might argue that participants in the repeated-event condition perceived more emotional stress at memory retrieval than participants in the single-event condition during the report sessions, elicited by the semantic links with the other traumatic video memories. This might have led to differences in recall performance between the conditions. However, a recent study showed that stress does not influence recall performance when using the SAI as the recall tool (Krix et al., 2016). These findings suggest that emotional impact is perhaps not an alternative explanation for the difference found in accuracy results between the conditions. Moreover, this view is in line with the finding that the increases in NA

scores in response to the target film were not related to accuracy, completeness, or inconsistency outcomes.

The results obtained here suggest that adults who have witnessed several similar traumatic events are less accurate in their testimony than adults who have witnessed a single traumatic event. This can have major consequences in a legal setting and other contexts. Be it a criminal case or an interview to assess the credibility of an asylum claim, a witness is expected to recall unique details pertaining to a specific episode (see Connolly & Price, 2013; Connolly & Read, 2006; Home Office, 2015). Therefore, our results suggest that we need to develop and test ways to increase accuracy in the reports of adult eyewitnesses who have witnessed repeated events. This could eventually contribute to the development of new witness interviewing strategies that improve the identification of episodic details of one target event among a series of similar events. Assuming FTT's prediction that in repeated similar events, gist traces become more accessible than verbatim traces, interviews directed at retrieving episodic (verbatim) details may benefit if generic prompts are avoided. Instead, the focus should be on episodic prompts that help cue distinctive details of a particular instance (also see Brubacher et al., 2011). This may help witnesses correctly attribute their memories to the corresponding events and to identify unique details pertaining to an instance of a given event. Our findings also warn that a more careful approach may be needed in interpreting witness reliability and credibility when there is a history of the witness or victim being party to other similar events. The expectations as to what we can expect from eyewitnesses in these situations should be adjusted. For example, the UK's asylum policy instructions (UK Home Office, 2015) should be amended to make reference to reports based on repeated event experiences.

The practical significance of obtaining data on adult memory for repeated event

experiences is important for several reasons. One of the biggest challenges facing our legal system today concerns the reliability of testimony given by complainants about repeated events in circumstances where no corroboration is available. For example, in seeking legal protection, asylum seekers who are often the victims or witnesses of multiple and repeated atrocities have to explain why they cannot stay in their country in line with the Geneva Convention relating to the status of refugees (United Nations, 1951). Being able to give a credible account of repeated experiences is also of crucial importance to victims of sexual trafficking. Trafficking cases typically involve multiple instances of abuse and rape that may cover years (Lehti & Aromaa, 2006; OSCE, 2013). There is ample evidence that asylum caseworkers and judges are influenced by the consistency of accounts provided (Herlihy et al., 2012; UNHCR, 2013). Hence it is critical that we understand what effect witnessing repeated events has on memory accuracy, completeness, and consistency.

This study contributes to the understanding of human memory and provides insight about factors that can influence eyewitness memory and testimonial performance. Few studies have focused on the effect of having experienced a series of related, similar events on memory, and to date, relevant research has only been conducted on child witnesses. Future research needs to establish whether our findings are specific to emotionally arousing negative events or whether they apply to other types of arousing events including positive experiences. Moreover, research is needed to disentangle whether our findings can be attributed solely to viewing semantically related materials, or whether they can also be explained by repeated exposure events that induce negative mood. There is some evidence to suggest negative emotion conveys focal benefits on memory for detail, although this does not mean all event details will be accurately remembered (Steinmetz & Kensinger, 2009). Research has also shown that the types of encoding processes

relating to memory (e.g., perceptual vs. elaborative processing) can differ based on the affective qualities of the emotional information (Steinmetz & Kensinger, 2009), as well as the reactions of individuals to such events (Herlihy et al., 2012). Moreover, future studies are needed to establish whether the changes in completeness are solely due to the passage of time and whether the retrieval environment and questioning technique can improve reports of memory for repeated events.

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## Appendix A

### Coding Manual



Department of Psychology, Eyewitness Research Group

<http://www.pc.rhul.ac.uk/sites/rheg/>

### Eyewitness Memory for Single versus Repeated Traumatic Events Coding Manual

#### Primary Goals:

1. To examine differences between reports from adults who have been subjected to witness repeated events and reports from adults who have been subjected to a single event in accuracy, completeness and consistency.
2. Check for possible external intrusions in the repeated event condition.

#### Coding Instructions

You have received 7 files attached in an e-mail:

- '**Coding Manual**' (*which is this one*)

This manual includes all instructions for coding and processing participants' data.

- '**Participants reports**'

This document includes the reports of participants you will be coding.

- '**CODING TEMPLATE**'

This Excel file is the template you will use for coding the participants' reports.

- '**OUTPUT EXCEL**'

This Excel file is the output file in which you will copy the results for every single participant.

- '**VIDEO 1 Aftermath + headsurgery.mp4**'

This is a video you will use for coding for possible intrusions from video 1 (v1).

- '**VIDEO 2 Aftermath + wounded knee + moving bodies.mp4**'

This is a video you will use for coding for possible intrusions from video 2 (v2).

- '**TARGET VIDEO.wmv**'

This is the video you will use for coding 'Accuracy', 'Distortions', 'Commissions' and 'Discrepancies'. These terms will be explained later on.

In this study all participants had to report their memory twice of a watched video, namely 'TARGET VIDEO.wmv'. From now on this video will be referred to as the 'target video'. Half of the participants



On the left you will find the list of units of information

Units of information are sentences or parts that are independent of all other information units *e.g. 'the woman with long blond hair' are 3 independent units of information namely: 'woman', 'long hair', and 'blond hair'*. As you can see the units of information displayed in this 'General' section mostly all display information that does not really fit any of the other sections as they do not display specific actions, people, vehicles or objects. The 'General' section therefore is a residual category in which you can assign units of information too that are informative but do not fit in any of the other 4 sections.

The screenshot shows an Excel spreadsheet with columns for 'Report session 1' and 'Report session 2'. The 'General' section lists various units of information, such as 'Accident', 'Traffic Accident', 'Road crash', 'Lost concentration', 'Head-on collision', 'Multiple car crash', 'Opposite lane', 'Victims', '3 female students', '2 of them died', 'Children unharmed', 'Hidden in shock', 'Rescue team', 'Taken to hospital', 'Bystanders', 'Removal from wreckage', 'Happened in Wales', 'Motorway or dual carriageway', 'Clear skies', 'Good weather', 'Road also in good condition', '3 cars', 'Trees and grass lining the sides of', 'Street lights', and 'Group of rescue workers'. A red circle highlights the 'General' section, and a blue box highlights the unit '2 of them died'.

If a unit of information is aligned after an indentation this unit of information then is describing the first not indented unit of information that is displayed above it. In the example above you see the unit of information displayed after the tab space describes that '2 -of the 3 female students- died.'

*e.g. 'the woman with long blond hair' will be:*

	A
1	woman
2	long hair
3	blond hair

**STEP 3**

Open the 'Participants reports' file.

Here you will find the participants reports. These reports consist of 4 sections. The first section (1) is a free recall participants stated of the events that happened in the target video. The second section (2 People) is about what participants could remember of the people involved in the video. The third section (3 Vehicles) is about vehicles and the fourth section (4 Objects) is about objects. As expected you will mostly find the same categorical units of information in the category section they have been reported in. However it is possible that these sections contain units of information of other sections as well.

You will find two reports per participant as they have reported twice on the same video.

First reports are titled: **'Measure: S4 - SAI\_1'**  
 Second reports are titled: **'Measure: S5 - SAI\_2'**  
 It is very important not to confuse these!

**STEP 4**

For one participant: copy the first report (Measure: S4 - SAI\_1) of the ‘Participants reports’ file into the ‘Report 1’ sheet tab of the ‘CODING TEMPLATE’ file. Copy the second report (Measure: S5 - SAI\_2) of the ‘Participants reports’ file into the ‘Report 2’ sheet tab of the ‘CODING TEMPLATE’ file. After this, write the participants number in the ‘Total results’ sheet tab under SUBJECT NUMBER (*cell H2*). Then save the Excel file in a map under the following name: ‘Participant ..’ and write the participant’s number on the ‘.’ space.

This way the new created file ‘Participant X’ is ready for coding and the Template File will remain empty for the next participant. All coding preparations for this participant are now done.

**STEP 5**

When coding a report, analyse the report for independent units of information and look whether the unit of information occurs in one of the sections (*general, actions, people, vehicles, objects*). If the unit of information is not occurring in any of the lists: add it to the list by copying or writing down the unit of information into the coding sheet under the right section. It does not matter whether the reported unit of information is correct or not! Automatically, a new row of coding cells should appear:

| 0 | 0 | 0 | 0 | 0 | | | 0 | 0 | 0 | 0 | 0 |

Coding is done by either or not changing the ‘0’ to a ‘1’ under the following sections:

1	A	Report session 1					Report session 2				
		C	D	Com	V1	V2	C	D	Com	V1	V2
2	General										
3											
4	Accident	0	0	0	0	0	0	0	0	0	0
5	Traffic Accident	0	0	0	0	0	0	0	0	0	0
6	Incident	0	0	0	0	0	0	0	0	0	0
7	Road	0	0	0	0	0	0	0	0	0	0
8	crash	0	0	0	0	0	0	0	0	0	0
9	lost concentration	0	0	0	0	0	0	0	0	0	0
10	head- on collision	0	0	0	0	0	0	0	0	0	0
11	multiple car crash	0	0	0	0	0	0	0	0	0	0
12	opposite lane	0	0	0	0	0	0	0	0	0	0
13	8 victims	0	0	0	0	0	0	0	0	0	0
14	3 female students	0	0	0	0	0	0	0	0	0	0
15	2 of them died	0	0	0	0	0	0	0	0	0	0
16	children unharmed	0	0	0	0	0	0	0	0	0	0
17	children in shock	0	0	0	0	0	0	0	0	0	0
18	Rescue team	0	0	0	0	0	0	0	0	0	0
19	taken to hospital	0	0	0	0	0	0	0	0	0	0
20	bystanders	0	0	0	0	0	0	0	0	0	0
21	removal from wreckages	0	0	0	0	0	0	0	0	0	0
22	Happened in Wales	0	0	0	0	0	0	0	0	0	0
23	Motorway or dual carriageway	0	0	0	0	0	0	0	0	0	0
24	Clear skies	0	0	0	0	0	0	0	0	0	0
25	Good weather	0	0	0	0	0	0	0	0	0	0
26	Road also in good condition	0	0	0	0	0	0	0	0	0	0

Descriptions	Instruction:

C' = correctly reported:	A unit of information is correctly reported when it occurs in the target video or in its description AND is reported without distortion.
D' = Distortion:	A distortion is a major detail change of an existing correct element <i>e.g. when a participant reports '5 victims' (instead of the correct 8 victims) this is a distortion.</i>
Com' = Commission:	A commission error is the introduction of a completely new element that is not occurring in the target video <i>e.g. 'a dog in car 2'</i>
V1 = intrusion from video 1:	An intrusion from video 1 would be a distorted reported unit of information or reported commission that is occurring in video 1 <i>e.g. 'the woman had head surgery on the spot'.</i>
V2 = intrusion from video 2:	An intrusion from video 2 would be a distorted reported unit of information or reported commission that is occurring in video 2 <i>e.g. 'close up and taking care of the men's wounded knee'.</i>
>D< = Discrepancy :	A discrepancy occurs when a reported unit reported in 'session 1' is conflicting with a reported unit in 'session 2' <i>e.g. session 1: 'The woman in car 2 had brown hair' - is conflicting with:- session 2: 'The woman in car 2 had blonde hair'</i>

Instructions can also be found under the sheet tab section 'Clarification & Instruction'.

**C:** When a unit of information is correctly reported; meaning that the reported unit of information occurs in the target video or in its description (*see appendix A*), Replace the '0' in the row of the unit of information under the column **C** by a '1'. The background colour for this cell will automatically turn **green**. When a unit of information is incorrectly reported OR has a distortion leave the '0' as a '0'.

**D:** When a unit of information is distorted; meaning that a major detail has been changed and therefore is incorrect, replace the '0' in the row of the unit of information under the column '**D**' by a '1'. The background colour for this cell will automatically turn **red**. When a unit of information is correctly reported leave the '0' as a '0'.

**Com:** When a unit of information is reported but is not occurring in the target video or its description replace the '0' in the row of the unit of information under the column '**Com**' by a '1'. The background colour for this cell will automatically turn **red**. When the reported unit of information is occurring in the target video or its description, leave the '0' as a '0'.

**V1:** When a reported unit of information is not occurring in the target video or its description but is occurring in video 1 replace the '0' in the row of the unit of information under the column '**V1**' by a '1'. The background colour for this cell will automatically turn **yellow**. When the unit of information is not occurring in video 1 leave the '0' as a '0'.

Note: only apply when the unit of information is incorrect, distorted or a commission!

**V2:** When a reported unit of information is not occurring in the target video or its description but is occurring in video 2 replace the '0' in the row of the unit of information under the column 'V2' by a '1'. The background colour for this cell will automatically turn yellow. When the unit of information is not occurring in video 2 leave the '0' as a '0'

Note: only apply when the unit of information is incorrect, distorted or a commission!

**>D<:** When a reported unit of information in session 1 is conflicting with another reported unit in session 2 replace the empty space in the row of the unit of information under the column '>D<' by a '1'. The background colour for this cell will automatically turn red. When the unit of information is not conflicting throughout reporting sessions leave the empty space as it is.

Make sure you code the units of information of report 1 under the 'Report session 1' section and the units of information of report 2 under the 'Report session 2' section.

When done with coding both report 1 and report 2 for one participant, save the 'Participant X' file.

## STEP 6

Open the 'OUTPUT EXCEL' file. You will see an empty **OUTPUT DATA** tab sheet with a row of categories in the top row.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	SUBJEC	Conditio	Session	Section	Correc	Distori	Comm	V1 Intr	V2 Intr	Discrej	Omissi	Total	Accura	Compl	Inconsist	taacy	Score
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
..																	

In the **Participant X** file under the tab section **OUTPUT** you will find a similar view with the same categories only with 12 rows of data beneath it. These are the results automatically calculated during coding. Check if these result data comply with your coding work. Under category SUBJECT the participant number should appear you have filled in under the SUBJECT NUMBER (cell H2) in the Total Results tab sheet.

Copy these 12 rows of data from the **Participant X** file into the **OUTPUT** file under the corresponding categories. After this save the **OUTPUT** file. For each next participant simply copy the 12 rows of output under the output of the previous participant in the **OUTPUT** file.



Repeat these steps for each participant. When done please send all the Participants X files and the OUTPUT file back to me: [Tjeu.Theunissen.2013@live.rhul.ac.uk](mailto:Tjeu.Theunissen.2013@live.rhul.ac.uk). Feel free to contact this email address with any questions or comments regarding this coding task.

### Additional instructions

1. Make sure you do not state and code a unit of information twice! For instance in different categorical sections.
2. Try to avoid cutting or copying whole lists of rows, this can disorder underlying cell formulas.
3. During coding it might be handy to highlight the reported units of information you have coded. This way you will always know where you have left off.
4. It can be handy to analyze a report for units of information by category and go to the next category when coding for the current category is done.
5. When coding the second report it is very important that you code the same unit of information in the same row with that of the first report. Otherwise these units will account as two different independent units which leads to more (invalid) inconsistency.
6. Keep the Target Video open in a background window as then it will be easy to quickly check for reference when having doubts about the coding of a unit of information.
7. It can be productive to check for Video 1 and Video 2 intrusions after you have coded all units of information for correctness, distortions and discrepancies, and even when you have this done for all participants.
8. In every category tab sheet there is a result section on the right. It can be helpful to check frequently whether your coding is correctly being summed up. If not please contact me [Tjeu.Theunissen.2013@live.rhul.ac.uk](mailto:Tjeu.Theunissen.2013@live.rhul.ac.uk) as there might be an error in the coding template sheet. (*O1, and O2 (Omission) are units that are not reported but occurring in the target video*)
9. **Coding can be a lengthy and exhausting process. Make sure you take enough pauses in between to avoid any fatigue errors.**

Report session 1						Session 1	
C	Di	Co	V1	V2	O1	Accuracy	Completeness
0	0	0	0	0	39	#DIV/0!	0
Report session 2						Session 2	
C	Di	Co	V1	V2	O2	Accuracy	Completeness
0	0	0	0	0	39	#DIV/0!	0
Total						Inconsistency Score	
39	0	0					0

***Coding Manual Appendix A***

These descriptions were presented to participants before watching the corresponding video:

**Video 1**

These three men were involved in a multiple pile up on the motorway. Unfortunately, two men died before they could be taken to a hospital. One man did survive the accident but sustained permanent dysfunction to one of his legs. One of their wives, who was sitting in the passenger's seat, did survive the accident although she sustained major injuries

**Video 2**

After a sudden rainstorm several collisions occurred at one spot on the motorway due to the slippery conditions and bad visibility. Eight people died, and of these, four died before they could be taken to a hospital. Here is a 21 year old woman who was trapped in her car. Unfortunately, she died before she could be taken to hospital. The baby survived the accident. The parents, 26 and 30 years old, also died during the accident. One woman, a 20 year old student, sustained massive internal injuries, injured skull and deep cuts to her face

**Target Video**

These 8 people were involved in a multiple car crash, which resulted when one of the drivers lost concentration and caused a head-on collision on the opposite lane. Among the victims were 3 female students, two of whom died and one who was severely injured. Two drivers of other cars died before they could be taken to hospital, while two young children sitting in the backseat were unharmed but in shock.