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RESEARCH ARTICLE

WILEY

How do adults with post-traumatic stress disorder from childhood trauma talk about single versus repeated traumas?

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Abstract

Adults with posttraumatic stress disorder from childhood trauma (ch-PTSD) described their 'worst' traumatic event (a single or repeated event) pre-post treatment for PTSD during an international clinical trial. The memory reports were coded for specificity (*Episodic vs. General*) and level of detail. Repeated event (RE) narratives contained more generic and fewer episodic references but no more details than memories describing single events (SEs). Analysis of a subset of the sample's post-treatment memory reports found 38% of the information units were consistent with the pre-treatment narrative, 38% were omitted, 21% were new details and 2% were changes. The SE and RE groups did not differ on consistency. The data provide a unique insight into single versus repeated event memory reporting in a clinical sample with PTSD from childhood trauma.

KEYWORDS

abuse, consistency, memory, PTSD, repeated single event, schema, trauma

1 | INTRODUCTION

The current research was motivated by a need to understand if memory reports for long-past single-event traumatic experiences differ from reports of events that were experienced in the distant past on multiple occasions. To date, the field has relied primarily on experimental studies questioning young children about non-traumatic events taking place over relatively short time periods (e.g., days or weeks from the time the first event is presented to the memory test). These studies have guided our theorising Brubacher et al., 2012,

Connolly & Gordon, 2014, Connolly et al., 2016; Powell & Thomson, 1996, see Woiwod et al., 2019, for a review). Yet frequently, the criminal justice system is required to deal with evidence from traumatised adults who allege repeat victimisation that occurred a long time ago when they were children (Connolly & Read, 2006). Unfortunately, data on the characteristics of memories for these real-life childhood traumas that often occur repeatedly are lacking.

The data reported here were collected during an international multicentre clinical trial. For details of the methodology of the clinical trial see Boterhoven de Haan et al. (2017). The complete results of

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the clinical trial are presented in a separate paper (Boterhoven de Haan et al., 2020) and will not be discussed further here.

In the current paper, our primary question is whether memories for single events (SE) and repeated events (RE) are stored and retrieved differently, as manifested in both the level of detail and the specificity of the information reported. This question is of particular importance from an applied perspective. For instance, in adversarial legal settings, the prosecution relies upon a charge being specific enough to allow the accused to raise a defence (see Connolly & Price, 2013; Connolly & Read, 2006; Woiwod & Connolly, 2017).

In addition, we studied the consistency in the way the memories are described across a 14–16 week interval (pre-post treatment) for a sub-set of the sample. This is of particular forensic relevance, because inconsistent memory reports tend to be judged as less credible than consistent ones (Brewer et al., 1999; Connolly et al., 2008; Fisher et al., 2014; Granhag & Strömwall, 2000; Weinsheimer et al., 2017). In criminal or civil proceedings, any inconsistency may flag up concerns that a witness's memory has become tainted, for example during therapy. Moreover, there is not any research that examines the nature of changes that occur in a memory report pre and post therapy. Nevertheless, current guidance on the provision of therapy for vulnerable witnesses (Crown Prosecution Service, 2002) states that therapists should avoid “discussing the evidence which the individual or any other witness will give, including exploring in detail the substance of specific allegations made” (section 11.9), and “any detailed recounting or re-enactment of the offending behaviour may be perceived as coaching” (section 11.11). An important goal of our pre-post study is to shed new light on whether memory reports for single versus repeated events change during the course of trauma-focused therapy.

2 | LEVEL OF DETAIL AND SPECIFICITY FOR SINGLE VERSUS REPEATED EVENTS

In healthy children and adults, two main classes of theories guide the understanding of how people organise and retrieve memories of REs. The first is schema theory (Brewer & Treyens, 1981), building on foundational work of Bartlett (1932) and Nelson and colleagues (e.g., Fivush, 1984; Hudson & Nelson, 1983). Scripts facilitate the organisation and retrieval of information that is common across repeated occurrences of an event—the general event representation (Schank & Abelson, 1977). A script can be formed after a single experience, but it becomes more detailed and complex with experience (Fivush, 1984). Scripts contain details that are fixed (i.e., details that always occur the same way), variable (details experienced differently across instances) and subject to deviations or unexpected changes (Woiwod et al., 2019). Scripts and memories for things that happen during specific instances can co-exist (Slackman & Nelson, 1984) but, according to the theory, scripts tend to be dominant and memory for individual instances of REs may be difficult to access over time (Brewer, 1986; Fivush, 1984; Hudson & Mayhew, 2009).

A second perspective on memory for single and repeat event experiences is fuzzy trace theory (FTT, Brainerd & Reyna, 1990). FTT

posits that generic (gist) and specific (verbatim) traces are encoded and stored simultaneously and independently of each other. Each time an event is experienced, the same gist trace may be strengthened and a new verbatim trace formed (Brainerd & Reyna, 2004; Reyna & Kiernan, 1994). The dominance of gist memory and the rapid decay of verbatim memory (Reyna & Titcomb, 1997) may make it difficult for individuals to access details about what occurred during a specific instance of a repeated episode. Accordingly, over time, individuals are more likely to report generic information at the expense of specific features of individual occurrences, and they are more likely to make gist-related errors (Brainerd et al., 2008). Taken together, both script theory and FTT predict that memory for single and repeated events becomes more general and less bound to the particular details of one specific episode with time, as memory recall becomes more reliant on general event representations or on dominant gist traces.

While the literature suggests that memory for repeated traumatic events may be less specific with respect to the context or time frame as compared with memory for single events, there is no suggestion that this will translate into a larger amount of specific information. Indeed, script theory and FTT would lead us to divergent predictions. A script during memory reconstruction will result in filling in gaps with details that fit the schema but the details may not be from the correct episode. Accordingly, RE reports may well contain the same level of details as SE reports (even though the former may be more likely to contain source monitoring errors). Notably, FTT makes a different prediction as this theory assumes all specific details of an event are encoded in individual verbatim traces, each of which becomes less accessible in the case of REs. Therefore, unless all specific details become encoded in the gist trace (e.g., because all REs are highly similar), reports of REs would be expected to contain a lower level of detail as compared with SE reports. Taken together, currently leading theories provide a good basis to expect reduced specificity (with respect to the event's time frame) in RE compared to SE reports, while theories tend to diverge when it comes to the number of specific details that should be expected.

A critical question is whether these differences in memory for single and REs can be expected also when the content of the memories is stressful and traumatic. Indeed, the PTSD literature suggests that traumatic content in itself has a minor effect on memory compared with the presence of PTSD (Brewin, 2011). People with PTSD typically experience repeated intrusions of 2–5 specific scenes which are accompanied by exceptionally high levels of sensory information, such as sights, sounds, odours. (Brewin, 2011; Ehlers et al., 2004), and these generally correspond to the worst or most distressing moments or events (Grey & Brewin, 2001). Contextual information, such as time and place, may be less well encoded; however, (Bisby et al., 2020). Intrusions are typically followed immediately by attempts to suppress or avoid them, which may reduce the degree of schematisation that would normally be expected to occur with repeated recall. As a consequence, if people with PTSD can freely choose a traumatic incident to report on, verbatim memory is likely to be prominent. Thus, speculatively, experiences of repeated abuse might appear similar to episodes of single abuse.

3 | PRIOR STUDIES ON MEMORY FOR SINGLE VS. REPEATED AVERSIVE EVENTS

In the extant literature addressing memory for REs, research has mainly focused on neutral or fun sessions in children, whereas research on memory for repeated negative events, particularly among adults, is in its infancy (for a recent review, see Dilevski, Paterson, Walker, & van Golde, 2020). Among a few notable exceptions, Goodman et al. (1994) interviewed children (ages 3–10) about a recent stressful medical procedure that had occurred once or was the last in a series of multiple procedures. They found no reliable differences for single versus repeated procedures – although it has to be noted that this comparison was not the study's objective. In an experimental study with adults, Theunissen et al. (2017) had participants view footage of the aftermath of a single road traffic accident once or three similar 'traumatic' films. Participants who saw multiple films were less accurate in their memory reports than the single incident group. Meanwhile, Dilevski, Paterson, and van Golde (2020), asked undergraduate women to imagine themselves in one or four domestic scenarios that were violent or neutral. After 1 week, those in the repeated-event conditions reported fewer correct details than those in the single-event conditions, but importantly, the stressful and neutral repeated-event conditions did not differ from one another. While these studies are a good starting point, the stress induced is relatively mild and retention interval is short. Hence we do not know if this experimental research can inform us about adult retrieval of single and repeated traumas from their childhood years.

4 | CURRENT STUDIES

The following hypotheses were tested in Study 1: Adults reporting an instance of repeated trauma experienced in childhood are more likely to make generic references concerning the time frame of the described episode, indicating a greater reliance on a general event representation than adults recalling a single instance of trauma experienced in childhood. We additionally explored the amount of detail referred to below as 'level of detail'. Based on script theory and FTT, either no difference or a lower level of detail may be expected in RE compared to SE reports of traumatic experiences. As there was no way to check the accuracy of the reports, we could not test whether RE reports would contain a higher number of source monitoring errors (i.e., report details that are accurate but pertain to a different episode than the one being described).

In Study 2, we compared the details reported pre- and post-therapy for those reporting a single or a repeated instance of the event in a subset of the sample to look at the consistency of what was reported. A dearth of systematic research led us to draw upon a case study of an adult witness who had experienced five armed robberies on three separate occasions (Connolly & Price, 2013). While there was considerable variability in what was reported in different interviews, there was moderate consistency with 60% of information reported in more than one interview. This corresponds to the

anecdotal observation that people with PTSD describe high levels of stability in the content of their trauma memories, although this has not been formally tested.

We therefore tentatively hypothesised that SE reports would be more consistent than RE reports when adults are asked to report details of a single instance of the RE. However, this prediction only partly aligns with currently leading theories. That is, script theory would predict that RE reports are more likely to contain source monitoring errors with an increase in discrepancies in details over time. Meanwhile, FTT would suggest that RE and SE mainly differ in their reliance on gist (over verbatim) traces, with no direct consequences for the consistency of recall.

All 155 adults in the current study had a diagnosis of ch-PTSD and were due to receive one of the treatment interventions. Each participant identified the worst/most influential trauma, and this index trauma was focused on in the present study. Note that this could be a RE, such as recurrent sexual abuse by a family member. All participants were invited to complete our memory questionnaire pre-post treatment. The paper is divided into two studies. Study 1 presents the memory reports of the adults ($N = 102$)¹ who had experienced a traumatic event which they reported as having occurred once (SE group, $N = 22$) or on a number of occasions (RE, $N = 80$) group. The second study using a sub-set ($N = 35$)² of the Study 1 sample compared the memory reports before treatment and after treatment to examine which information content that was the same, omitted, new and changed.

5 | STUDY 1

5.1 | Method

5.1.1 | Participants

The participants in the pre-treatment sample ranged in age from 19 to 62 ($M = 35.4$, $SD = 13.08$) with a mean age of 33.8 in the single group and 38.0 years in the repeated group. Of the 102 participants, 79 self-identified as female, 22 as male and 1 selecting the 'other' option. Thirty-three participants received treatment in Australia and the remainder in Europe (16 from Germany, 53 from the Netherlands). Participants completed the measures in the main language of the country in which they were residing (Dutch, German, or English) and the narratives were translated by native German and Dutch speakers into English. About half the sample (50.5%) reported having completed education to the higher education level and 47.4% to secondary or high school level only. Two participants reported completing only to primary school level.

5.2 | Materials

The Clinician Administered PTSD scale (CAPS-5: Weathers et al., 2018) rates the frequency and intensity of PTSD symptoms and

a higher score is indicative of greater symptom severity (range 0–80). CAPS-5 data could not be retrieved for five participants (two in the SE group). The average pre-treatment score based on the sum of B, D, C, D and E DSM-5 criterion scores was 38.20 ($SD = 9.41$) for the SE group and 36.93 ($SD = 11.09$) for the repeated group and did not differ between groups, $t(91) = .46, p = .65$. The dissociative severity scores from the CAPS were 1.60 ($SD = 2.19$) and 1.13 ($SD = 1.60$) for the SE and RE groups, respectively, $t(91) = 1.10, p = .28$. The average duration of the PTSD was 158 months for the SE group and 227 months for the RE group, $t(96) = 1.67, p = .10$. The Beck depression inventory (Beck et al., 1961) score did not differ between groups (SE: $M = 30.6, SD = 11.3$; RE: $M = 30.9, SD = 10.9$). All participants were screened for psychiatric disorders using the structured clinical interview or mini international neuropsychiatric interview, as well as trauma history (see Boterhoven de Haan et al., 2020 for details and exclusion criteria).

An online memory questionnaire was administered via the software programme EMIUM prior to the commencement of the randomised clinical trial (RCT). Participants were asked to select between the instruction set A (single traumatic event) and instruction set B (traumatic event occurred two or more times), for example, in case of repeated assaults by the same person (see Appendix 1). The instructions were identical for each set in that they prompted participants specifically to write an account of their index traumatic event in as much detail as possible, including age, descriptions of the surroundings, feelings, and perceptions during the event. The instruction set B (repeated) specifically stated: “Although you have indicated that the trauma you selected has occurred more than once in your life, I'd like you to choose the specific occasion it happened that was the worst for you.” Participants had as much time as they needed to complete the task and no word limits were imposed. Data were collected from October 2014 to June 2019.

5.2.1 | Translation, parsing and coding of the trauma narratives

This section describes the procedure of how the trauma narratives were parsed, and coded. As some of the involved researchers only knew their mother tongue English, the narratives written in Dutch ($N = 48$) and German ($N = 15$) were translated into English by a native German speaker educated in the Netherlands (fluent in Dutch, English and German).

5.2.2 | Parsing and preparation for coding

In a first step, the trauma narratives were parsed into Units of Information. We had to balance the challenge of parsing the units into chunks that were large enough to code for general/episodic information, while trying to separate what we perceived as separate happenings reported by the participants. Therefore, Units of Information were defined as a sentence or part of a sentence which contains a single idea unit, as for instance “I was a young girl” or “I was asleep in

my bed”. The following parsing rules were applied: Information which was logically linked (e.g., use of the word “because”) to another piece of information was kept together in one unit of information (e.g., “arguing with a friend at the party because I was drunk and being silly”). Direct or indirect quotes were counted as one unit of information (e.g., “my father said, ‘let's just take this off’”). Chains of actions (e.g., “My mother forcefully opens the door,” and “loudly and aggressively opens the roller shutter”) were parsed into separate units of information. We were only interested in analysing information about the trauma events reported by participants. Some units were excluded from further coding and analyses because the units were not directly related to the trauma event. For example, descriptions concerning the impact the traumatic event had on the participant's life or current feeling concerning the traumatic event (e.g., “I think about it now and I feel dirty and angry that he has robbed me of my childhood”).

The parsing of narratives into chunks of information were conducted independently by two trained researchers (S. A. and J. S.) on a randomly selected subset of 36 narratives (45.6% of total narratives), which were parsed into 436 units of information. In order to estimate the inter-rater agreement, the proportion of agreed units was calculated by dividing the total number of agreements by the total number of agreements and disagreements (agreement rate was 86.7%). Disagreements were resolved by discussion and one researcher (J. S.) parsed the remaining narratives. These first two preparatory steps resulted in parsed trauma narratives, which only included the relevant units of information describing the traumatic event. The next paragraph describes the coding procedure, which was applied on these units of information.

5.2.3 | Coding level of detail and specificity

Each unit of information was coded on two variables – Level of Detail and Specificity – on three-point scales. The level of detail score reflects the amount of descriptive detail provided in each unit of information. A score of 1 was given if only the main or core information was provided (e.g., “my father hit me” or “I showered with him”). If the core information was further specified by one descriptive detail, a level of detail score 2 was assigned (e.g., “my father hit me in the face” or “I showered with him in my parent's bathroom”). When two or more descriptors were given, the level of detail score was 3 (e.g., “my father hit me in the face and my nose started bleeding” or “I showered with him in my parent's bathroom with burning hot water”). The level of detail scores were summed and divided by the number of coded units in order to derive the mean level of detail index for each narrative.

The second variable Specificity aimed to capture the instance, time frame or specific episode the unit of information was referring to. We based our coding of specificity on previous research done by Schneider et al. (2011) which utilised the use of specific time frames to indicate specific/episodic memories. When no time frame was provided or the information was referring to the general description of the traumatic event (e.g., “I would shower with him” or “In my childhood”), the specificity score 1 (*Generic*) was given. In contrast, for a

unit of information describing a specific moment in time or referring to a single occasion, a score of 3 was given for specificity (*Episodic*, e.g., “It was Christmas Day when it happened” “I was in the bathroom with my Grandpa”). These specificity categories are comparable to prior research analysing trauma narratives (e.g., Brubacher & La Rooy, 2014). Units of information containing a mixture of specific and generic details (e.g., “around the time when I started school”) were assigned to the specificity Category 2 (*Intermediate*). If one unit of information did not contain enough information to determine an appropriate specificity code, the coder would look to previous units of information for clarifying information. For example, if a participant stated a specific time and place and then listed a chain of separate actions (e.g., “it happened in my dad’s bedroom”, “first he sat next to me”, “then he grabbed my hands”), the coding of those separate actions would be coded with the original time placement in mind (e.g., dad’s bedroom). We interpreted language such as “next”, “after that”, “then” as indicating a precise moment in time. All specificity scores were summed and divided by the number of coded units in order to derive the mean specificity index for each narrative. Table 1 contains some examples of our specificity coding.

Two research assistants, one whom was blind to RE and SE conditions and research hypotheses, received extensive instruction in the coding procedure. The two coders coded together for training purposes and then coded five narratives at a time separately. They met to discuss disagreements and repeated the process several times. The inter-rater reliability (*c*) was moderate and given the highly sensitive nature of the material being coded, it was deemed sufficient. The ICCs based on absolute agreement for single measures were $ICC(2,1) = .72$ (95% CI: [.59, .80]) for level of detail and $ICC(2,1) = .66$ (95% CI: [.54, .76]) for specificity.

TABLE 1 Examples of specificity coding in units of information

Unit of information	Specificity code given	Explanation for code
I would shower with him	1	“would” indicating general language
Showed me lots of attention and affection	1	General, summary-like language
She hit us for about half an hour	2	Indicates a range in time, neither general nor specific
She screamed something, but I do not know exactly what	2	Unable to recall direct quote, but knows there was one
It was Easter holidays 1987, I was 12.5 years old	3	Provided a precise time and age
I froze completely on the chair where I was sitting	3	Provided a precise place

Note: Each example is from a separate narrative.

6 | RESULTS

6.1 | Traumatic events

The youngest age at which trauma was described as occurring in the written narrative was age 4 years. Sixty percent of the SE group reported having directly experienced (vs. witnessed) the traumatic event, whereas 88% of the RE group reported directly experiencing the trauma. For the SE group, the traumatic event was sexual violence in 50% and physical violence in 25% of the cases. For the RE group, the trauma was sexual violence in 60% of cases and physical violence in 32% of cases. Other traumatic events reported were witnessing of death and serious injury or accident. 83.3% of the sample affirmed that emotional abuse and neglect physical/emotional “applies to me”. For 79 participants, the age at which the ‘worst’ trauma occurred was reported. On average, those reporting a SE were older when the event occurred ($M = 11.63$ years, $SD = 2.88$) than those reporting a RE ($M = 9.06$ years, $SD = 3.76$), $t(77) = 2.98$, $p = .03$.

6.1.1 | Level of detail and specificity

On average, those in the SE group reported 12.80 ($SD = 6.44$) information units while those in the RE group reported 11.52 information units ($SD = 6.78$), a difference that was not statistically significant $t(100) = .76$, $p = .45$, $Cohens\ d = .10$. The mean level of detail as scored on the 1–3 scale, where a higher score indicates more detailed recall, was 2.05 ($SD = .33$) for the SE group and 1.98 ($SD = .33$) for the RE group, a difference that was not statistically significant, $t(100) = .83$, $p = .4$, $d = .12$ (equal variances not assumed).

The mean specificity scores on our 1–3 scale for the SE and RE groups were 2.77 ($SD = .30$) and 2.49 ($SD = .59$), respectively, $t(100) = 3.08$, $p = .03$, $d = .32$ (equal variances not assumed). Thus, the SE group were making more specific references as compared to the RE group, as predicted. In order to further illustrate these effects, Table 2 shows the proportion of units of information categorised as generic, specific, or a mixture of the two, separately for each group (single, repeated event).

7 | STUDY 2

7.1 | Method

Treatment sessions comprised twelve 90 min sessions for a period of 6–8 weeks. The post-treatment memory reports were collected

TABLE 2 Proportion of generic and specific units of information coded on the 1 (generic) to 3 (specific) scale

	Generic	Generic/specific	Specific
Single ($N = 20$)	.02	.18	.80
Repeated ($N = 82$)	.16	.20	.64

8 weeks after treatment, with 21 participants (four in the SE group) having undergone eye movement desensitisation and reprocessing (EMDR) and 15 (three in the SE group) having undergone imagery rescripting. The administration of the questionnaire and instructions were as per the pre-treatment phase. We focus exclusively on differences in consistency between SE and RE, because the small case numbers do not permit an analysis of interaction effects with treatment type. The treatments and outcomes are reported elsewhere (see Boterhoven de Haan et al., 2020).

Adopting the same criteria as per the pre-narratives, a total of 35 narratives met our criteria for inclusions and enabled us to compare descriptions of the trauma before and after treatment for this small subset. Unfortunately few participants followed the instructions post-treatment to describe their traumatic event(s) possibly due to fatigue after a lengthy intense clinical trial. Due to a lack of power, we did not code for specificity on this occasion and focused instead on consistency.

7.2 | Participants

The 35 participants (seven from the SE group) in this post-treatment sub-sample ranged in age from 19 to 62, ($M = 35.40$, $SD = 13.08$) and the age at which the trauma described in the narratives ostensibly occurred ranged from 4 years to 17 years, ($M = 9.54$, $SD = 3.85$), based on $N = 34$ stating age of occurrence. Of the 35 participants, 30 self-identified as female, four as male and one selecting the other' option. The country of residence of the sample was mixed, with eight participants from Australia, seven from Germany, and the remainder from the Netherlands. About half the sample (45.71%) reported having completed education to the higher education level and half to secondary or high school level, with one completing only to primary school level.

Comparing the sub-sample on their PTSD scores (i.e., CAPS-5 severity) revealed no significant group differences between the SE and RE groups at pre-treatment, $t(34) = .52$, $p = .60$, or at post-treatment, $t(34) = .91$, $p = .37$. In both groups, there was a significant drop in severity from pre- to post-treatment, SE group: $t(6) = 6.25$, $p = .01$; RE group: $t(26) = 5.14$, $p = .001$ (See Boterhoven de Haan et al., 2020 for further details).

The average age at which trauma occurred based on participants' reports was 12.05 years ($SD = 3.02$) for the SE group ($N = 6$; 1 missing) and 8.98 years ($SD = 3.61$) for the repeated group ($N = 27$, 1 missing), $t(31) = 2.11$, $p = .04$. In line with the sample of Study 1, those in the repeated group ($N = 28$) described multiple traumas in the checklist (most notably sexual abuse, emotional abuse, neglect), and all in the single group ($N = 7$) checked sexual abuse as the trauma that "applies to me".

7.2.1 | Translation, parsing and coding of the trauma narratives

The post-treatment narratives were translated and parsed in exactly the same way as per Study 1 – into units of information. Coders were blind as to whether the event was from the SE or RE group. After

checking that the same event/occasion was being described, the pre- and post-treatment units for each participant were "matched" making some allowances for slight changes in phrasing and precision. For example, "I think I was 6–8 years old" (pre) and "I was about 8 years old" (post) was rated as consistent. An example of a change in phrasing but a consistent detail was "In that moment, I felt the electricity going through my body" (pre) and "I felt a sharp and hot jolt of pain in my body" (post). Details that were mentioned in the pre-narrative but were omitted post-treatment were omissions. Details that were mentioned for the first time post-treatment were coded as new information. Finally, we coded changed details, where the information reported pre- and post-treatment was inconsistent or contradictory. An example was "My father had a chair in his hand" (pre) and "One of the two had the chair, A second coder independently coded 20% of the narratives, agreement was 88% and any discrepancies were resolved by discussion. Tables 4, 5 and 6 give examples of the units of information coded in each of the categories illustrating changes in information, omissions and new details, respectively.

8 | RESULTS

There were slightly more units of information in the pre-therapy ($M = 12.90$, $SD = 6.92$) narratives as compared to post-therapy ($M = 11.11$, $SD = 5.20$) narratives, $t(34) = 1.67$, $p = .11$. There were no significant differences in the number of units of information in the post-treatment narratives by condition, SE group: $M = 10.71$, $SD = 7.48$; RE group: $M = 11.21$, $SD = 4.64$; $t(33) = -.17$, $p = .88$.

8.1 | Pre-post consistency data: Consistent, omitted, new and changed

The main measure of interest was the proportion of consistent units, that is, those units of information that conveyed the same information in the pre- and the post-treatment memory narratives of the participants' index trauma. The first thing to note is that across the sample as a whole, 37% of the units of information were consistent, 39% were omissions (reported pre-treatment but not post-treatment) and 21% of the units were new pieces of information reported for the first time post-treatment. Overall only 2% of the units were changed (contradictory) details. Table 3 presents the consistency data by condition (single vs. repeated) and shows what units were consistent and the changed units (omissions, new and changes) and Tables 4, 5 and 6

TABLE 3 Mean proportion of consistent versus inconsistent (omitted, new, changed) by group (SD in parentheses)

Group	Consistent	Omitted	New	Changes
Single ($N = 7$)	.32 (.16)	.44 (.20)	.20 (.12)	.04 (.09)
Repeated ($N = 28$)	.41 (.16)	.35 (.18)	.22 (.17)	.01 (.03)

TABLE 4 Changes in units of information from pre- and post therapy

Participant ^a	Pre-therapy	Post-therapy
21 SE	I remember he undressed himself	And he is standing in his underpants
23 RE	I had peed on myself	My father beats me up so long until I pee myself
23 RE	Also in this situation I feel nothing, but I'm shaking all over my body.	All the time I feel helpless, paralysed and beaten/broken.
78 RE	I feel sick to my stomach and ill	I felt that I had done the best I could.
15 RE	He laid/sat on top of Pieter (little brother) and	My older brother takes my little brother to the ground
25 RE	my arms and legs also start tingling and trembling.	my body like stunned, so that I cannot move.
56 SE	my father has a chair in his hand.	one of the two has a chair in the hand, I do not see exactly who it is.
56 SE	I jumped in the middle of it to make sure they would not throw with a chair.	I am standing just in the kitchen and want to jump in between them.

Note: Changes represent only 1.3% of the information units.

Abbreviations: RE, repeated event; SE, single event.

^aTo further protect participant identify in this large multi-country clinical trial, new numbers have been assigned to the memory narratives.

provide examples of the pre- and post-therapy memory reported with examples of changed (inconsistent), omitted and new details.

In a series of *t*-tests (equal variances not assumed), we did not detect any significant differences between the SE and RE groups in proportion of consistent information units, $t(33) = 1.31, p = .22, d = 10$, omissions $t(33) = 1.19, p = .29, d = .26$, new information $t(33) = .42, d = .08, p = .64$, or contradictions $t(33) = .76, p = .47, d = .22$.

9 | GENERAL DISCUSSION

Script theory, FTT, and empirical research on traumatic memory would predict some differences in the reports of our adult ch-PTSD sample with single versus repeated events. In laboratory research, repetition supposedly increases common features of the events at the expense of specific details, whereas studies of people with PTSD suggest that perceptual details are preserved at the expense of contextual details. In the current study, our RE group produced accounts that were less specific in regards to the timeframe of the event, as compared with participants describing a single traumatic incident. Also notable was the finding that the lower level of specificity in RE

TABLE 5 Omissions, (information that was provided pre-therapy but omitted post-therapy)

Participant #	Unit of information
18 RE	it was a bathtub with the shower in it
18	the shower curtain was closed,
18	His genitals rubbed on me
18	I remember the sound of water in my ears
82 RE	I said I would get in trouble if my parents found out,
82	but he convinced me it would be a fun movie night.
82	he lay down next to me, and thats when i remember feeling a little worried,
82	he said to me "i always wanted to sleep next to you with no clothes"
39 RE	I laid in bed all night long with strong fear and listened to the noises in the house.
39 RE	I was helpless
91 SE	the three of us (mum, brother, and me) sleep.
91	I have to laugh and tell my mum what I see.
91	My mum does not find it funny
21 SE	He (uncle) stank of cigarettes
21	His body was scrawny and I could feel his bones everywhere.
21	I was afraid that he, after it happened, he would also kill me by choking me.

Abbreviations: RE, repeated event; SE, single event.

TABLE 6 New information that was provided post-therapy but not pre-therapy

Condition	Unit of information
38 RE	The most traumatic events were the self-administered abortions by my mother.
38	I called my father for help.
38	My mother was lying in bed and was bleeding heavily.
24 RE	I was afraid that he would beat me to death.
24	After he had calmed down, he disappeared downstairs again.
24	I was still alive and ultimately had not gotten more than a few hits.
91 SE	The room is bright.
91	In my memory I am all calm, as if time is standing still.
05 SE	wanting to go home straight away and change my undies because there was blood in them,
05	but she had to do groceries, so I stayed in the car with my baby brother.
05	wanting to tell mum, but thinking that I would be in trouble for drinking, staying at some ones place, and that she would say or think it was my fault.
05	we stopped at the bottle shop on the way and the boys we were with bought more drinks.
05	We went back to this girls house and were mixing up drinking with different liquers in her kitchen.

Abbreviations: RE, repeated event; SE, single event.

memory reports was not accompanied by a lower level of detail. In Study 2, we found no differences between SE and RE reports in pre- to post-therapy consistency.

There are a number of plausible explanations for why, after lengthy delays, the reports of single and repeated traumas may differ in their specificity but not in their level of detail. That is, the similar amount of detail per information unit in the two groups is line with the theory that in reconstructing a memory, gaps will be filled with schema-congruent details. In addition, memories for specific instances (and variable options) are thought to co-exist with scripts. If the instances are very similar or very frequent, general event representations or gist are likely to be more accessible than verbatim memories. However, this balance may shift if the instances are dissimilar, occur less often, or are widely spaced in time. In the case of abuse, incidents may vary a great deal in when and where they took place, what happened, what was said, and what preceded and followed the event. Such variation will be greater than that commonly encountered in laboratory studies and may strengthen verbatim memory, making it accessible for a longer time. A final explanation relates to the fact that participants in the current study entered therapy addressing PTSD symptoms associated with the incident they reported. This suggests that they had been experiencing intrusive memories of the instance, perhaps for a very long time. This, too, may have increased rehearsal of their memory and resulted in heightened report consistency across time.

Based on Connolly and Price (2013)'s single case study, we tentatively predicted that SE reports would be more consistent than RE reports, a hypothesis that was not supported by our data. As an explanation, unlike the case described in Connolly and Price (2013), participants in the current studies were in therapy between reports and were repeatedly guided in their recall of the incident. This may have increased rehearsal additionally, such that there were no differences across interviews. This suggests that the current data is specific to pre and post therapy when the purpose of the therapy is to help participants to cope with their memory of the target instances. On a theoretical level, the absence of an effect on consistency does not contradict FTT (because gist memory is not necessarily inconsistent). Instead our data suggest where when there are differences or deviations across instances and an individual is asked to recall one instance, we may expect inconsistencies across reports. However, if the individual reports what typically happens, stability across reports is expected.

It is noteworthy that the first report was made many years after the experience. We cannot be precise about the retention interval, as not all participants reported the age at which abuse (first) occurred. The sample here had an average current age of 33 years and with a mean age of 10 years as age when abuse took place/started, so we are looking at a retention interval of 20+ years in some cases. Accordingly, the RE and SE memory may have stabilised and very little incremental forgetting would be expected (Rubin & Wenzel, 1996). Had a report been taken shortly after the event, we may have seen more inconsistency across reports and a difference between RE and SE participants. There is also the potential effect of therapy to consider. It would be of interest to assess whether following successful

treatment, when intrusive memories become less emotional and are less avoided, memories of different events became less distinctive and more gist-like. Currently we lack data from studies with lengthy delays that can tell us what memory representations for single/repeat events look like.

Moving on to methodological concerns, several of our analyses were under-powered due to smaller and more uneven sample sizes than we had hoped for, with only 102 in pre-treatment condition (80, RE; 22 SE) and 35 in the post-treatment condition (7 SE). For .80 power and a large effect we required N=26 per condition. Hence we exercise caution in interpreting the effects of of event frequency on the variables we measured, particularly given the unequal group sizes and small sample size in the SE groups.

A final methodological limitation that must be considered is the possibility that verbal SE and RE reports may be similar, even if there are true qualitative or quantitative differences in the underlying RE and SE representations. For instance, differences might be overshadowed because the prompt was the same for both SE and RE groups (see Appendix below for the instructions). In both cases, participants were asked to describe their worst memory, cueing a specific account. Indeed, as can be seen from the data in Table 2, participants typically reported specific details. There are two issues to take into consideration here when planning further research in this area. First, participants' response may have been in some way shaped or constrained by the prompt, influencing the retrieval pattern. Second, it is likely that asking for the worst case of a series of events leads participants to select an event that stood out (deviated from what typically happens). The experimental literature suggests such deviations may make an instance of a RE more memorable (Brubacher et al., 2011; Connolly et al., 2016). FTT would also lead us to predict a stronger verbatim trace for the deviating instance of a RE. Where memory accuracy data are available, it would be worthwhile to examine adults' ability to attribute childhood memories of repeated traumatic events to the correct instance and examine their memory for details that deviate from what typically happens.

10 | CONCLUSION

Our unique sample provided us with an opportunity to undertake an exploratory look at the stability of memory reports after a long delay and during the course of therapy. This is particularly important when making decisions about the credibility of a witness. Here, we looked at differences in the content of recall pre-post therapy. An inspection of Table 3 shows that only a minority of participants changed their accounts and the discrepancies did not substantially change the interpretation and outcome of the events being described. This indicates some stability in the memory representation although without a measure of ground truth the data cannot speak to the reliability of the memory. Importantly, based on these unverified self-reports alone, we tentatively conclude that therapeutic interventions implemented after a long delay do not appear to substantially alter people's accounts. If replicated in more extensive studies, this may lesson

concerns about the effect of trauma-focussed therapies on the reliability of complainants' accounts.

Follow-up studies in clinical samples are highly warranted, since most of what we know today about memory for RE concerns memory for repeated benign events occurring close together (ranging from 2 days to 2 weeks; Woiwod et al., 2019 or filmed or imagined stressors over delays of less than a month). Notably, this may not be representative of all real-life trauma, some of which may persist for several years with longer delays between instances. In real life, thinking about (e.g., re-living and re-experiencing) an event may lead to a general event representation in the same way as repeatedly experiencing the event. Another question that has yet to be addressed is whether children and adults differ in SE and RE traumatic memories. Our findings highlight the pressing need for more systematic research into the memory of SE and RE traumatic events.

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CONFLICT OF INTEREST

The authors do not have any conflict of interest to declare.

ENDNOTES

¹ The original sample in the study was 155. Memory narratives were excluded if they were incomprehensible or only provided information on the impact the traumatic event. Two experts (CB and AM) blind as to whether the participants had self-identified as SE or RE agreed on the inclusion of the narratives. Where there was a lack of clarity and discrepancy in whether it was SE or RE that was being described, a third rater (TM) was called in to resolve disagreements. Where ambiguity as to whether an event being described was single or repeated could not be resolved, the narrative was excluded. The final sample was 102.

² Only a proportion of the original sample opted to complete the post-treatment question about their memory and not all provided an account that could be suitably coded. Some participants only commented on their feelings post-therapy and some provided too few words or were incomprehensible. As with the pre-treatment narratives, CB, AM and DC agreed on the post-treatment narratives to be included and these comprised a small number (35).

DATA AVAILABILITY STATEMENT

Due to their confidential and sensitive nature of patient disclosures, the data are not publicly available and identifiers have been removed in the text.

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A. APPENDIX 1: INSTRUCTIONS

A single traumatic event (Instructions A)

Please describe below the trauma that you described in the interview with the research assistant. Please state how old you were when it happened, and the events leading up to the incident in as much detail as possible. I would like you to tell me about how you felt, what you saw and heard, and everything that you can remember about the event in as much detail as possible. This includes details about the surroundings, and your actions, feelings and thoughts throughout the incident.

A traumatic event (the same/similar event) that occurred two or more times (Instructions B)

Please describe below the trauma that you described in the interview with the research assistant. Although you have indicated that the trauma you selected has occurred more than once in your life, I

would like you to choose the specific occasion it happened that was the worst for you. Please state how old you were when it happened, and the events leading up to the incident in as much detail as possible. I would like you to tell me about how you felt, what

you saw and heard, and everything that you can remember about the event in as much detail as possible. This includes details about the surroundings, and your actions, feelings and thoughts throughout the incident'.