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# Can Listening to a Verbal Trauma Report Induce Intrusions? – Replication of a Randomized Trial

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## ABSTRACT

Recent evidence suggests that indirect verbal exposure to traumatic events can be sufficient to cause intrusions and other posttraumatic stress symptoms. In this study, we used a verbal trauma report to experimentally induce intrusions and a tactile task to manipulate the putative processes underlying intrusion development. Our findings indicate that the verbal report indeed induced intrusive recall. Moreover, the verbal report induced negative mood, state anxiety, and state dissociation, with mood and state dissociation predicting intrusion development. Additionally, the tactile task interfered with intrusion formation as indicated by the primary diary measure, but not the retrospective self-report. However, these results await further replication as this and previous trials suffered from limited statistical power. The findings support the reports by trauma therapists who experience secondary traumatization. They also challenge the assumption that all intrusions develop bottom-up from low-level sensory input via sensory representations. Future studies should explore differential processes for intrusion development based on their modality.

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Intrusive thoughts; imagery;  
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## Introduction

Professionals treating traumatized clients are verbally exposed to graphic details of traumatic events (as defined by the DSM-5) as part of their job by hearing their clients describe their experiences. Posttraumatic stress disorder (PTSD) symptoms are a well-documented potential consequence of this indirect verbal exposure, a phenomenon called secondary traumatization (for a meta-analysis see Hensel et al., 2015). Intrusions are considered key symptoms of secondary traumatization and entail the involuntary and distressing recall of trauma details. They are assumed to develop without direct sensory input, i.e. purely as a consequence of the indirect verbal exposure to a traumatic event that another person experienced first-hand (J. K. Daniels, 2006). The empathic relationship with the client might trigger high emotional

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arousal in the therapists (Levine & Edelstein, 2009), which in turn might partially explain the increased, involuntary recall (Holland & Kensinger, 2010). Emerging evidence suggests that intrusive reliving is especially likely to develop when the therapist dissociates during encoding, i.e. while the client describes graphic details of the traumatic event (J. Daniels, 2007; Püttker et al., 2015; Thomsen et al., 2017). Previous studies showed that therapists who endorse going into a dissociative mode (i.e. experiencing low-level depersonalization and derealization while listening to their client describe the traumatic event) reported more severe and longer lasting symptoms of secondary traumatization. This might be the result of altered peritraumatic encoding of the trauma information or due to habitual dissociation following the exposure (as has been discussed for primary trauma victims; Beutler et al., 2022; Mertens et al., 2022; Ozer et al., 2003).

However, little experimental research exists that would allow drawing conclusions about the encoding process leading to intrusive memories in therapists. Most previous experimental studies used visual trauma material (i.e. participants view a film with aversive content) as an experimental analogue of trauma exposure and assessed the resulting intrusions, an approach termed the *trauma film paradigm* (James et al., 2016). The vicarious exposure of the therapists, however, does not entail visual stimuli but rather verbal descriptions of the client's experience. Therefore it is of interest that Krans and colleagues (Krans et al., 2010) introduced a nonvisual version of the trauma film paradigm (i.e. a verbal report of trauma details from the perspective of an observer (field perspective)), which allows studying the translation from auditory material to visual intrusions in a controlled laboratory setting. To mimic the empathic engagement of therapists, participants were instructed to actively imagine the described events from a field perspective. Listening to the audio material led to significant increases in negative mood and state anxiety, but not in state dissociation. In the following week, participants developed a comparable number of intrusions as participants who watched a visual depiction of the same traumatic event (Krans et al., 2011). Dorahy and colleagues later also employed an audio version of the trauma film paradigm and did find significant associations between state dissociation during vicarious exposure and both the frequency and distressfulness of intrusions in the following three days (Dorahy et al., 2016). Our first goal is therefore to replicate the finding by Krans et al. (2010) that a significant amount of intrusions develops in response to listening to a verbal description of a traumatic event and to further explore the role of state dissociation in this process.

Prominent models such as the cognitive theory of PTSD (Ehlers & Clark, 2000) or the dual representation theory of PTSD (Brewin, 2014; Brewin et al., 2010) suggest that in response to traumatic experiences, a shift in information processing from high-level conceptual/verbal

processing toward low-level perceptual/sensory processing occurs. That is, memory encoding is suggested to be limited to direct sensory stimuli, lacking proper embedding in their situational context (Brewin et al., 2010). Experimentally manipulating these putative processing shifts within the trauma film paradigm is considered a useful approach to test the causal inferences of these models: Interference tasks (e.g. visuospatial tasks, verbal tasks, imagery rescripting carried out while watching the traumatic film) indeed seem to lead to a significant, albeit small, reduction in subsequent intrusion frequency (pooled effect size after bias correction  $g = -0.23$ ; Asselbergs et al., 2023). However, it remained unclear whether such interference tasks have a similar effect for purely verbal exposure, i.e. whether secondary traumatization can be prevented by engaging in interference tasks during listening to the client's report. Krans et al. (2010) explored this topic by comparing two interference tasks (visuospatial and verbal) to listening without concurrently carrying out any additional task. Negative mood and state anxiety increased in all three conditions to the same degree, while state dissociation showed a diverging pattern with a significant decrease in the visuospatial condition. During the following week, participants in both interference conditions reported significantly fewer intrusions than the participants who did not carry out any additional task concurrently.

The present study aims to replicate the findings that engaging in a visuospatial interference task results in lower state dissociation during exposure and lower intrusion frequency in the week thereafter as compared to the control group. In conjunction, we will test in the control group without any concurrent task (1) whether intrusions develop in response to a purely verbal trauma report, (2) whether exposure to the verbal report increases negative mood, state anxiety, and state dissociation, and (3) whether these in turn predict subsequent intrusion frequency. As compared to the control condition, we expect that (4) the visuospatial interference condition is associated with significantly reduced affective reactions and intrusion frequency.

## Method

The Ethics Committee Psychology of the University of Groningen approved the study (ECP CODE: 17118-SP-N (a,b)). All participants were informed about the nature of the study before providing informed consent. The study was preregistered on [aspredicted.org](https://www.aspredicted.org) (registration number: #9865). We followed the procedures of Krans et al. (2010) as closely as possible, but see section 2.6 for deviations from the original study. Materials (or their Dutch translations) without a reference were developed and provided by the authors of the original study.

## Participants

Our a-priori analysis indicated a necessary sample size of  $n = 102$  to detect a medium effect in the outcome measures. In total, 256 individuals started online participation, but 126 participants were excluded because they did not finish the screening ( $n = 6$ ) or met the exclusion criteria ( $n = 120$ ). Exclusion criteria encompassed depressive episodes (current and lifetime), panic attacks, panic disorder (current and lifetime), PTSD (current and lifetime), drug misuse and dependency (current), psychotic episodes (current and lifetime) as well as a history of road traffic accident. Participants were assessed online using the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998; van Vliet et al., 2000) and a short questionnaire on road traffic accident history. Of those who started lab participation ( $n = 65$ ),  $n = 4$  were excluded due to insufficient language proficiency or dropped out (t1:  $n = 63$ ; t2:  $n = 61$ ). As a result, we did not manage to test the envisioned number of participants due to time constraints.

The final sample ( $n = 61$ ) consisted of  $n = 44$  (72.1%) women and  $n = 16$  (26.2%) men, as well as one person who indicated “other” (mean age 22.31,  $SD = 4.29$ , range 18–47). Participants were either first-year psychology students who participated in exchange for course credit ( $n = 16$ ) or were recruited via a paid participant pool ( $n = 45$ ) and received 21€ for full participation. Many of the latter were students from higher years and/or other departments of the university.

## Procedure

This study had three parts – an online screening and two lab sessions (see Figure S1). All questionnaires were presented using Qualtrics. During the first lab session, participants filled in state questionnaires and participated in an imagery training (Holmes et al., 2008), during which participants were instructed to visualize a lemon and its different features with their eyes closed using field perspective. Next, they listened to the verbal trauma report (also described from the field perspective), while imagining the scenes. Adherence to the procedure was tested using several compliance checks and changes in affect were assessed using state questionnaires. Subsequently, they were shown the online intrusion diary (Holmes et al., 2004) and were instructed to report all intrusions originating from the verbal trauma report. This served as the primary measure of intrusion frequency (the intrusive nature of the reported incidences were verified by the researchers by inspecting the description of the intrusion). Participants were sent an online link every day of the following week via e-mail and had to specify the modality of the intrusion (visual, verbal or both), the content, and how much tension they felt on a scale from 0 (*not at all*) to 10 (*extremely*). One week later, they returned to the lab to complete the

intrusion provocation task, and fill in a memory fragmentation rating, a diary compliance rating, a cognitive avoidance item and to undergo a cued recall and recognition memory test. Subjects were then asked to report the frequency of PTSD symptoms as well as posttraumatic cognitions during the preceding week. For the whole assessment, a standardized protocol was used (for details on the instruments please see the supplement).

### **Lab session 1: experimental task and assessments**

We employed the original Dutch verbal trauma report, which contains four scenes describing the aftermath of road traffic accidents. The cover story is that a journalist dictates a description of these scenes for later use, with the background noise audible. Each scene was preceded by a short introduction about the people involved and the outcome of the accident. The report was delivered through headphones and participants were instructed to keep their eyes closed and to imagine the scenes as if looking through one's own eyes (i.e. using field perspective). The total audio file lasted 11:42 minutes. While listening to the script, participants either carried out no additional task (control group) or alternately modeled cubes and pyramids from clay (experimental group). The experimental group was instructed to work as fast and as accurately as possible while their hands were hidden from view. Prior to initiation, participants were provided with a model of each shape, which they were asked to duplicate once for training. The mean amount of plasticine objects formed in the visuospatial interference condition was  $M = 17.84$  ( $SD = 6.15$ ), comparable to the original study ( $M = 20.33$ ;  $SD = 5.22$ ).

Following the experimental task, all subjects answered several compliance check items.

Both, before and after exposure to the verbal trauma report, all subjects were assessed using three state questionnaires: a mood questionnaire (Davies & Clark, 1998) with a one-item distress rating added (see Holmes et al., 2004) consisting of five items was used to assess state happiness, fear, horror, depressed mood and anger (current sample: pretest  $\alpha = .80$ , posttest  $\alpha = .82$ ; example: "How angry do you feel right now"). Answers were given on a dimensional scale from 0 (*not at all*) to 10 (*extremely*). State anxiety was assessed using the 20-item STAI-State version (STAI-S; Spielberger et al., 1983; van der Ploeg, 1980; current sample: pretest  $\alpha = .89$ , posttest  $\alpha = .93$ ) rated on a scale from 1 (*almost never*) to 4 (*almost always*, example: "I feel calm"). State dissociation was measured with the Dissociative States Scale (DSS; Bremner et al., 1998; Hageraars et al., 2008; current sample: pretest  $\alpha = .77$ , posttest  $\alpha = .85$ ) consisting of 19 items rated from 0 (*not at all*) to 4 (*very much*, example: "Things around me seemed strange or unreal"). Finally, we assessed whether participants were able to sustain their attention on the report using a single item rated from 0 (*not at all*) to 10 (*completely*).

### **Lab session 2: intrusion provocation task and assessments**

After one week, participants returned to the lab and underwent an intrusion provocation task (IPT; modified by Krans et al., 2010; Lang et al., 2009), which was used as a secondary outcome measure to assess the frequency of intrusions. Ten short fragments (four seconds each) of the verbal trauma report were delivered via headphones, and participants were subsequently instructed to close their eyes for 2 min. and to press keys when they had to think about the report. Two different keys were used to classify the thoughts as visual or verbal.

Fragmentation of the memory for the report and cognitive avoidance of the traumatic content, were each measured with one 10-point item (see supplement). In addition, participants were asked whether they were unable or forgot to report intrusions in the diary using a single item (Davies & Clark, 1998; Hagenaars et al., 2008) rated from 0 (*not at all*) to 10 (*very much*). This diary compliance rating did not differ significantly between the two groups (CG:  $M = 3.55$ ,  $SD = 2.19$ ; EG:  $M = 3.57$ ,  $SD = 2.57$ ;  $t = -.03$ ,  $p = .98$ ). Finally, actual retention was assessed in two ways: recall was measured with a 12-item cued recall memory test with open answers, which were scored according to an answer key. Recognition memory was measured with a 12-item recognition memory test presenting statements about the report in a dichotomous (yes/no) format (Holmes et al., 2004).

As an additional secondary measure, frequency of intrusions during the preceding week was assessed with the *Impact of Event Scale, revised* (IES-R; Mouthaan et al., 2014; Weiss & Marmar, 1997), which consists of 22 items referring to intrusions (current sample:  $\alpha = .79$ ), avoidance (current sample  $\alpha = .69$ ) and hyperarousal (current sample:  $\alpha = .62$ ) rated from 0 (*not at all*) to 4 (*very much*).

Cognitions in relation to the report were measured with the *Posttraumatic Cognitions Inventory* (PTCI; Foa et al., 1999; van Emmerik et al., 2006) consisting of 33 items clustering on three subscales (negative cognitions about the self, current sample:  $\alpha = .88$ ; negative cognitions about the world, current sample:  $\alpha = .86$ ; and self-blame, current sample:  $\alpha = .79$ ) that were rated from 1 (*totally disagree*) to 7 (*totally agree*).

Finally, the perceived goal of the study was explored using an open-answer item. Only one participant in the visuospatial condition was able to make a fairly accurate statement about the purpose of the experiment.

### **Deviations from the original study**

The most substantial difference to the original study was that we excluded the verbal interference condition based on its smaller effect size in the trauma film paradigm (Asselbergs et al., 2023) and because it did not show a differential



effect on state dissociation in the original study. A screening of drug misuse and dependency was added (Sheehan et al., 1998) for which we employed the published cutoff scores to exclude subjects. In case of depressive episodes, we thought it to be inadequate to allow exclusion based on the sole indication of disturbed social and occupational functioning and added a follow-up question investigating the degree of disturbed functioning (“If yes, please indicate the degree to which your functioning was impaired;” rated on a 7-point scale; exclusion criterion:  $\geq 5$ ). Also, the time span for alcohol misuse was modified from “the past 12 months” to “the past week” to prevent over-exclusion in a student population (Lorant et al., 2013). Moreover, the screening for a history of fainting and blood phobia was excluded.

### **Data analysis**

To investigate whether the manipulation was successful and to examine whether there were differences between the conditions regarding mood, state anxiety, and state dissociation, three  $2 \times 2$  mixed model ANOVAs for the within-subjects factor time (before and after the report) with the between-subjects factors condition (control vs. experimental) were employed. For all three scales (mood questionnaire, STAI-S and DSS), total scores were used. Multiple regression analyses were conducted within the control group to test whether the difference scores for mood, state anxiety and state dissociation would predict the intrusion frequency in the diary or any of the secondary outcome measures. Regarding the statistical threshold,  $p < .05$  (two-sided) was considered significant.

To assess whether visuospatial interference led to less frequent intrusion development, three one-tailed t-tests were used to compare conditions on the frequency measures. For the diary and the IPT, total sum scores were employed, whereas for the intrusion subscale of the IES-R, the mean was used. For all other measures, two-sided t-tests were employed. Except for one of the subscales of the PTCI (negative cognitions about the self), Levene’s test yielded non-significant results across all t-tests, indicating equal variances.

One outlier in the IPT was removed, because it was apparent from the logbook that the participant did not understand the task instructions. All other values were considered valid as extreme responses might reflect true experiences. All statistical tests were computed using SPSS version 24.

## **Results**

### ***Induction of intrusions in the control group***

Several intrusions were reported by both groups via the diary as well as in the secondary outcome measures (see Table 1). To test whether the pre-post difference scores for mood, state anxiety, and state dissociation would predict intrusion frequency, regression analyses were conducted in the control group.



For the diary, the full model was significant ( $F(3, 27) = 3.58, p = .03$ ) and the overall model fit was  $R^2 = .53$ . However, only increases in state dissociation were significant predictors of intrusion frequency ( $\beta = .54, p = .01$ ), whereas mood ( $\beta = -.50, p = .84$ ) and state anxiety ( $\beta = -.50, p = .25$ ) were not. Intrusion frequency as reported via self-report questionnaire (IES-R intrusion subscale) was predicted by difference scores for mood ( $\beta = -.46, p = .03$ ) as well as state dissociation ( $\beta = .52, p < .01$ ), but not state anxiety ( $\beta = .41, p = .06$ ; with the full model being significant ( $F(3, 27) = 9.04, p < .01$ ), model fit:  $R^2 = .71$ ).

In contrast, intrusion frequency as reported during the intrusion provocation task was neither predicted by changes in mood ( $\beta = .21, p = .42$ ), nor state anxiety ( $\beta = .20, p = .49$ ) or state dissociation ( $\beta = -.08, p = .71$ ; with the full model being n.s.:  $F(3, 27) = 1.41, p = .26$ ; model fit:  $R^2 = .37$ );

### Effect of the experimental manipulation

To assess whether visuospatial interference led to fewer intrusions, the two groups were compared to each other. As hypothesized, significantly fewer intrusions were reported in the experimental group as compared to the control group via the diary (see Table 1, partial eta-squared = .05, indicating a small effect size). However, this was not mirrored by the IPT, which in contrast resulted in significantly more intrusions in the experimental group. No significant difference between the groups emerged for the IES-R intrusion subscale, which showed a significant, moderate correlation with the diary ( $r = .47, p = < .001$ ). The IPT neither correlated significantly with the diary ( $r = -.06, p = .642$ ) nor the IES-R intrusion subscale ( $r = -.07, p = .615$ ).

**Table 1.** Descriptive statistics.

		Control group		Experimental group		Total	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age		21.61	3.00	23.03	5.26	22.31	4.29
SUIS		39.45	6.73	38.37	7.20	38.92	6.93
STAI-T		41.74	9.84	36.77	7.36	39.30	8.99
DES-II		7.51	5.80	12.15	9.63	9.79	8.19
Mood Q.	Pre	12.00	5.47	11.16	6.66	11.57	6.07
	Post	19.19	6.24	17.34	8.37	18.25	7.40
STAI-S	Pre	36.10	6.98	32.41	6.91	34.22	7.14
	Post	42.74	8.29	41.13	10.09	41.92	9.21
DSS	Pre	20.58	2.36	21.09	3.52	20.84	3.00
	Post	22.52	4.99	23.97	5.85	23.25	5.45
Closed-eyes		1.03	.18	1.06	.246	1.05	.215
Listening		3.87	.88	3.50	.67	3.68	.80
Imagery comply.	Vivid.	2.72	.54	2.66	.42	2.69	.48
	Distr.	2.79	.75	2.58	.69	2.68	.72

SUIS = Spontaneous Use of Imagery Scale; STAI-T = State-Trait Anxiety Inventory-Trait version; DES-II = Dissociative Experience Scale, revised; Mood Q. = Mood Questionnaire; STAI-S = State-Trait Anxiety Inventory-State version; DSS = Dissociative States Scale; Imagery comply. = Imagery compliance; Vivid. = Vividness.; Distr. = Distress; P-values below .05 are considered significant and printed in bold.

**Table 2.** Means (M) and Standard Deviations (SD) of experimental measures within, across and between conditions.

	Control group		Experimental group		Total		Between groups		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	$\eta_p^2$	<i>p</i>
Diary	3.48	3.54	2.17	2.07	2.84	2.96	1.77	.05	<b>.03</b>
Provocation task	3.17	2.84	4.67	2.96	3.92	2.98	-2.00	.07	<b>.03</b>
IES-R, intrusion	1.50	.35	1.47	.43	1.49	.39	.33	<.01	.37
IES-R avoidance	1.55	.45	1.52	.58	1.53	.51	.27	<.01	.39
IES-R hyperarousal	1.12	.25	1.07	.17	1.10	.21	.84	.01	.20
Single-item avoidance	2.19	1.60	2.33	2.04	2.26	1.82	-.30	<.01	.77
Fragmentation	7.90	2.02	9.10	1.65	8.49	1.93	-2.53	.10	<b>.01</b>
PTCI Total	58.97	24.88	51.13	11.55	55.11	19.74	1.57	.04	.12
PTCI NC about Self	1.64	.67	1.41	.32	1.53	.54	1.69	.05	.10
PTCI NC about World	2.44	1.23	2.10	.87	2.27	1.07	1.26	.03	.21
PTCI Self-blame	1.50	.89	1.39	.54	1.44	.74	.58	.01	.56
Attention	8.97	1.38	8.25	1.12	8.60	1.29	2.28	.08	<b>.03</b>
Cued recall	5.39	1.69	5.00	1.88	5.20	1.78	.85	.01	.40
Recognition	8.16	1.81	8.23	1.61	8.20	1.70	-.16	<.01	.87

IES-R = Impact of Event Scale, revised; PTCI NC = Posttraumatic Cognitions Inventory Negative Cognitions. P-values below .05 are considered significant and printed in bold.

### Manipulation checks

Listening to the verbal trauma report led to increased state dissociation ( $F(1, 61) = 21.89, p < .01, \eta_p^2 = .26$ ), state anxiety ( $F(1, 61) = 55.82, p < .01, \eta_p^2 = .48$ ) and negative mood in both groups (main effect for time:  $F(1, 61) = 45.87, p < .01, \eta_p^2 = .43$ ). This effect was independent of the condition participants were in (no significant main or interaction effects :Mood: condition  $F(1, 61) = .93, p = .34, \eta_p^2 = .02$ , time by condition  $F(1, 61) = .26, p = .61, \eta_p^2 < .01$ ; State anxiety: condition  $F(1, 61) = 2.21, p = .14, \eta_p^2 = .04$ , time by condition  $F(1, 61) = 1.02, p = .32, \eta_p^2 = .02$ ; State dissociation: condition  $F(1, 61) = 1.00, p = .32, \eta_p^2 = .02$ , time by condition  $F(1, 61) = .84, p = .36, \eta_p^2 = .01$ ). The two groups also did not differ significantly on the cued recall memory, recognition memory tests, eye control item, listening control item, or the imagery compliance check.

Significant group differences did emerge for memory fragmentation and the attention ratings with the experimental group reporting more fragmentation and less attention than the control group (see Table 2).

### Discussion

The present study aimed to replicate the findings of Krans et al. (2010), which indicated that (1) intrusions can result from exposure to a purely verbal description of a traumatic event and (2) might be less likely to emerge if the listener is simultaneously engaging in a tactile task. We were able to replicate the main finding that listening to the verbal report suffices to induce intrusive images. However, we were only partially able to replicate the effect of the visuospatial interference task: While fewer intrusions were reported by the

experimental group via the diary, our primary outcome measure, this effect was small. Our secondary measures were not consistent with this result as the intrusion subscale of the IES-R did not show significant differences between the groups and the IPT even indicated significantly more intrusions in the experimental group.

### ***Affective reactions to the trauma material***

In line with Krans et al. (2010), we observed significant increases in negative mood and state anxiety during exposure to the audio material, which were comparable in both groups and similar to the original study. Diverging from the original study, exposure also consistently led to increased state dissociation in both groups. Increased state dissociation, in turn, predicted intrusion development as assessed via the diary as well as with the IES-R intrusion subscale (but not the IPT in the control group). This is in line with previous findings by Dorahy et al. (2016) that state dissociation during the listening task is associated with a higher subsequent intrusion frequency. It also converges with findings in acutely traumatized subjects prompted to recall their traumatic event (J. K. Daniels et al., 2012), that peritraumatic dissociation is associated with greater activation of brain regions otherwise implicated in the vividness of autobiographic memories. In conjunction, this further supports the notion that peritraumatic dissociation might be directly related to memory encoding processes.

### ***Intrusion development – primary vs. secondary outcome measures***

The average intrusion frequency reported by our sample (via the diary and the IES-R intrusion subscale) was somewhat lower than in the original study, which could simply be due to the slightly lower compliance. Alternatively, the rigorous screening procedure employed in the present study might have resulted in a greater average resilience regarding intrusion development. The visuospatial task led to a significantly reduced amount of intrusions as reported via the diary, although the reduction only indicated a small effect and was nominally smaller than the effect in the original study. In contrast to the original study, the findings on the secondary intrusion measured did not line up with the diary reports. The retrospective self-report did show a non-significant difference between the conditions. This might be due to the fact that IES-R subscale was not designed to capture the pure frequency of involuntary recall, but rather the level of intrusion-based symptoms including distress rated on a 5-point scale (Weiss & Marmar, 1997). It might therefore not have been sensitive enough to capture the differences between the two groups. This is supported by the moderate correlation with the diary.

Regarding the IPT, no significant associations with the other two intrusion measures could be established, which might call the validity of the IPT task as a secondary measure of intrusiveness into question. While the diary and the self-report both measure the frequency of intrusions during the days following the exposure, the IPT assesses how often participants think about the content of four-second fragments of the audio report that they listened to merely a few seconds ago, one week after the original exposure. As our results diverge from those of the original study, future studies should explore whether the IPT truly prompts intrusions and not just memory recall.

### ***Experimental control measures***

Regarding experimental control measures, significant group differences were only detected for memory fragmentation (in contrast to the original study) and attention (in line with the original study), with the experimental group reporting more memory fragmentation and lower attention than the controls. However, as in the original study, this did not result in significant group differences in vividness and distress ratings or differential memory performance during the recognition test.

### ***Limitations***

As our sample consisted mostly of students, generalizability to the general population and to trauma therapists, specifically, remains to be demonstrated.

A major limitation of this study is that a great proportion of the sample did not pass the screening criteria, threatening its representability. As a result, we did not reach the desired sample size and the results were subject to power issues. This might have prevented us from detecting all relevant effects that exist on a population level or might have produced spurious effects. The original study did not report their exclusion rate, but as we followed their exclusion procedures (and where we deviated, made them less exclusionary), one would have to assume a similar bias. We thus call on future studies to reconsider whether such strict exclusion criteria are indeed ethically necessary and to strive for inclusion from the general population (rather than psychology students).

The previous analogue studies employing a verbal trauma report (Dorahy et al., 2016; Krans et al., 2010) or a trauma film (see Asselbergs et al., 2023) also tested small samples and thus likely suffered from similar power issues. Thus also the observed differences might be spurious and future studies should ensure enough statistical power to corroborate the results.

To mimic natural much therapists engage in visual imagery when listening to their clients, we instructed the participants to imagine the events described in the verbal report and subsequently assessed how

vividly these were imagined. While the two groups did not differ significantly from each other regarding the vividness of the imagined events, this instruction might have prompted more visual processing than might occur naturally in psychotherapists. Future studies should therefore consider including a condition in which the participant is not instructed to actively imagine the described events.

### **Summary**

We successfully replicated the finding that intrusions can develop from a purely verbal description of a traumatic event. While several questions are still open, such as the exact brain mechanisms subserving intrusion formation, these results help explain why professionals who are regularly exposed to descriptions of traumatic details (i.e. trauma therapists, child protection workers etc.) might develop secondary traumatic stress symptoms.

Concurrently engaging in a visuospatial task successfully reduced intrusion formation, according to our primary outcome measure. However, this might simply have been due to distraction, i.e. a state of dual attention (as indicated by the lower attention ratings in the group executing the concurrent task). This seems likely as carrying out the task did not significantly buffer against increases in dissociation in the participants. State dissociation, in turn, significantly predicted intrusion development. In conjunction, these results indicate that it might be imperative for therapists to avoid increases in state dissociation while listening to their client's trauma report. Therapists might experiment with using similar dual attention tasks while awaiting ecologically-valid replications of this effect.

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## Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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