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ABSTRACT

A trigger warning is an alert that upcoming material containing distressing themes might "trigger" the details and emotion associated with a *negative memory* to come to mind. Warnings supposedly prevent or minimise this distress. But, do warnings really have this effect? To simulate the experience described above, here, we examined whether warning participants—by telling them that recalling a negative event would be distressing—would change characteristics associated with the immediate and delayed recall of a negative event (such as phenomenology e.g., vividness, sense of reliving), compared to participants who we did not warn. Generally, we found that time helps to heal the "emotional wounds" associated with negative memories: negative characteristics—such as emotion, vividness etc.—faded over time. However, the event's emotional impact (the frequency of experiences related to the event such as "I had trouble staying asleep"), subsided less over a two-week delay for participants who were warned in the first session. Our findings suggest that warning messages may prolong the negative characteristics associated with memories over time, rather than prepare people to recall a negative experience.

A *trigger warning* is an alert that upcoming material (e.g., DC's 2019 film *Joker*) containing upsetting themes (e.g., graphic violence) might "trigger" intrusive memories about a related stressful event. "Triggered" memories can be very distressing, and trigger warnings supposedly help to prevent or minimise this distress (e.g., Friday, 2016). But do warnings actually have this effect? Although research has focused on the emotional effects of warnings when people encounter novel stimuli, we do not know whether warnings minimise the distress associated with bringing *a negative memory* to mind—the expected outcome of the "triggering" process. A worrying possibility is that warnings might distort negative memories in potentially harmful ways, for example by making memories *seem* more distressing. Indeed, we know that negative expectations—such as those that warning messages create—can cause or exacerbate negative reactions (i.e., the nocebo effect; Benedetti et al., 2007; Myers et al., 1987). Moreover, the details and perceived impact of our personal memories—even very negative or traumatic memories—are, in general, highly susceptible to distortion (Pickrell et al., 2017; Talarico & Rubin, 2003). Here, we sought empirical evidence for the idea that a warning would distort characteristics associated with the immediate and delayed recall of a negative event, including phenomenology (e.g., feeling like one is reliving the event), how central the event felt to people's identity, and its

emotional impact (i.e., distressing symptoms). We also explored one potential mechanism that might help to explain how warnings help or harm; the coping strategies people use to cope with recalling the negative event.

In recent years, the topics potentially covered by trigger warnings have expanded far and wide (e.g., racism, blood, classism, pregnancy, etc.; LSA Inclusive Teaching Initiative, 2020), as have the range of emotional experiences such warnings are intended to help mitigate—from being mildly offended/distressed through to "re-traumatization" (Carter, 2015). The typical *popular* definition of a trigger warning is quite vague: an alert that upcoming material may be distressing. Prior work has focused on this definition, examining people's general emotional reactions when they encounter various types of *novel* stimuli, such as negative films (Sanson et al., 2019), images (Bridgland et al., 2019), and text passages (Bellet et al., 2018). From this research, we know that viewing a warning increases negative *anticipatory* reactions, but has little effect on subsequent *reactions*, towards potentially distressing material. Further, warnings do not seem to reduce distress among people with a trauma history, or for people who identify that study material (e.g., a description of a murder scene) reminds them of their most traumatic experience (Jones et al., 2020). Taken together, this initial work shows that general trigger warnings—which warn of upcoming distressing material—do not seem to help

ameliorate negative reactions towards negative stimuli or stimuli that may have a connection to a stressful experience.

Here, however, we intended to investigate trigger warnings as they were *originally* defined—which has not yet been the subject of any empirical investigation. The term "trigger warning" originates from Posttraumatic Stress Disorder (PTSD) research showing that stimuli with characteristics similar to a traumatic event can "trigger" a person to re-experience the trauma (Ehlers et al., 2004). Re-experiencing symptoms include vivid thoughts, feelings and flashbacks about the event (Ehlers et al., 2004). Trigger warnings, therefore, were originally intended to mitigate the "triggering" process by alerting viewers that upcoming content may spark the recall of traumatic memories, specifically, not just that provocative or sensitive material may be encountered (Haslam, 2017). These ideas about the original purpose of trigger warnings are therefore central to the debate about the use of trigger warnings for people suffering from PTSD, and/or trauma survivors, and persist in informational materials disseminated today. For instance, The Innocent Lives Foundation (2020)—a source cited by social media influencers who use trigger warnings—claims that "memories for trauma are worse without warning" and that "trigger warnings are simple ways to help survivors avoid reliving the event."

Despite the prominence of these claims, no work has examined how trigger warnings may change how someone *remembers* a stressful/negative experience. Here, we aimed to simulate "triggering" the recall of a negative memory by specifically instructing participants to recall a negative event, and then examining whether warning participants about the potential for this process to be distressing would help (e.g., reduce distress) or harm (e.g., increase distress). To investigate one potential mechanism underpinning *why* a warning may change the ways in which a memory is recalled, we asked participants to report the strategies they used to cope with the negative event. The way we remember and relate to the past is critical for the maintenance of mental health and well-being (Adler & Pansky, 2020) and has implications for several clinical disorders (e.g., Posttraumatic Stress Disorder; Oulton & Takarangi, 2017). Therefore, how warnings may change (or not change) how a negative event is recalled is central to assessing their use as an adaptive tool. We explore these ideas in more detail next.

How might a warning message affect the way that a negative event is initially recalled?

It is well established that setting up an expectation of negative *physical* health symptoms such as pain, itch, and other side effects can cause or exacerbate those very outcomes—known as the nocebo effect (e.g., Benedetti et al., 2007). It is therefore possible that warnings may also affect psychological outcomes pertinent to *mental health*, such as exacerbating the emotional

impact of a negative event. Indeed, we know that seeing a trigger warning leads to a noxious anticipatory period (Bridgland et al., 2019) and that negative anticipatory information akin to warnings (e.g., that upcoming material is negative in nature) can enhance attention to negative stimuli, resulting in increased distress (Shafir & Sheppes, 2020). We also know that it is easier to recall memory details when someone is in the same emotional state as when the memory was encoded (Bower, 1987). Therefore, warning people about recalling a personal event may create a negative anticipatory period that, in turn, may change how a negative event is subsequently recalled.

The are several possible ways a warning might change the subsequent recall of a negative event. The warning might lead someone to retrieve an "*objectively*" more negative event (e.g., a Criterion A event in the DSM-5 involving actual or threatened death or serious injury; e.g., sexual assault, physical assault, loss of a loved one—although we do note that it is difficult and even controversial to define how objectively negative an event is, especially because people can have PTSD symptoms for events that do not meet Criterion A; Rubin & Feeling, 2013). Or, the warning may not change the event that is recalled but may enhance negative interpretations about the event. Either possibility should lead people to remember the negative event with more negative characteristics (such as emotional intensity, vividness), and to perceive that event as having greater emotional impact, and more centrality, compared to people who recall a negative event without a warning. Nevertheless, to increase the likelihood that participants would retrieve similarly negative events with and without a warning, and thus focus on participants' *interpretation* of those events, we constrained the recall period to events occurring during the past two weeks.

How might a warning change the way a negative experience is remembered over time?

While we know memories generally fade over time, we also know that external feedback about past events can change how we remember them. Typically, the details (Talarico & Rubin, 2003) and emotion (Walker & Skowronski, 2009) associated with negative events diminishes over time. Moreover, the mere act of thinking about and answering questions about a negative event on measures of memory characteristics (e.g., vividness, valence, sensory details, etc.) can decrease negative reactions towards that memory (Boals et al., 2011; Rubin et al., 2010). Therefore, it is likely that participants will report an overall decrease in negative characteristics associated with their memory over the two-week period. However, it is possible that seeing a warning message at initial recall may reduce these general "healing effects" of time and warned participants may report a smaller reduction in negative memory characteristics.

Extant literature shows that exposure to misinformation about past events can change how we remember them (Loftus, 2005); including and perhaps even more so for negative events (e.g., Brainerd et al., 2008). Warnings, therefore, may also affect how a negative memory is recalled over time. For instance, around 80% of military personnel who recently completed Survival School Training, endorsed misinformation for non-trivial event details such as the identity of their interrogator (Morgan et al., 2013). Importantly, however, false feedback can also change how we *feel* about past events. For example, participants who read reviews that a negative film was tolerable, reported fewer distress symptoms after a week than participants told the film was distressing, or neutral information (Takarangi et al., 2014). Similarly, in Takarangi and Strange (2010), participants told their negative memory was *worse than* others' experiences reported greater stress, negative emotions, and vividness associated with the memory, a week later (vs. no feedback). Warnings could also distort memories for negative events over time by giving people more confidence that their memory was distressing and harmful or leading them to reconstruct their memory to align with negative appraisals. This process may also lead to an increase in the feeling that an event is central to one's identity—an outcome related to Post-traumatic Stress Disorder symptoms (PTSD; Berntsen & Rubin, 2006).

Do trigger warnings change coping strategies?

To investigate a potential mechanism for the way trigger warnings may change the way a negative event is recalled, we also examined reported coping strategies. Unlike emotional reactions, coping strategies require an active effort to manage one's thoughts, emotions, and behaviours (Folkman & Moskowitz, 2004). Therefore, if warnings increase helpful coping strategies like proponents claim (McNeil, 2015; Palmer, 2017) we should find evidence that they are helping participants actively engage in strategies to assist in managing any distress associated with recalling the memory. For instance, a warning may remind someone to engage in emotional reappraisal (changing the way a situation is construed to decrease its emotional impact; Gross & John, 2003). Coping strategies may therefore help us understand how trigger warning messages may (or may not) affect the characteristics associated with the immediate and delayed recall of a negative event.

The present study

To investigate how warning messages may change how a negative event is initially recalled and remembered over time (e.g., emotional impact) and the strategies used to cope with the event, we asked participants to recall a recent negative event that had occurred in the past two weeks (Session 1); a fortnight later they recalled the same

event again (Session 2). Prior to initial recall in Session 1, we randomly assigned participants to either view a warning message—informing them that the negative memory task was distressing—or an unwarned control condition. We had an additional exploratory aim; to examine if warnings might have accumulative effects (e.g., would a participant who was warned twice experience the smallest reduction in negative memory characteristics over time?). Although trigger warning messages are becoming increasingly prevalent in day-to-day life (e.g., on television, social media, in university etc.), no research has examined repeated exposure to warning messages across different experimental sessions. We therefore repeated our warning procedure in Session 2 (i.e., we randomised participants again to view or not view a warning message).[1]

In line with prior trigger warning research, we predicted that warned participants would experience a negative anticipatory period prior to completing the memory recall task (i.e., increases in negative mood and anxiety, and decreases in positive mood, from pre-to post-warning message). We hypothesised that in Session 1, participants given a trigger warning (vs. no warning) would report more negative memory characteristics (e.g., greater sense of reliving the event, greater emotional impact). Due to the healing nature of time, we predicted that participants' negative memory characteristics will likely diminish over the two-week delay. However, we predicted that this pattern will depend on whether participants received a trigger warning during Session 1 (i.e., an interaction between condition and time). Specifically, we anticipated that participants who received a warning in Session 1 would report a smaller decrease in negative characteristics over time (or possibly an increase in negative characteristics), compared to unwarned participants. We also anticipated that those who receive a warning in both Session 1 and Session 2 would report the smallest reduction (or largest increase) in negative responses over time due to the accumulated effect of the warning messages. Finally, it is possible that participants who were warned in Session 1 may have more negative mood and anxiety scores at the beginning of Session 2, due to anticipating feeling negative upon entering the testing room.

Method

The Flinders University Social and Behavioural Research Ethics Committee approved this experiment. Our preregistration, data, and supplementary files are located at: https://osf.io/dxnbp/. We have reported all measures, conditions, and data exclusions.

Participants and design

A total of 239 participants took part in Session 1. Of these, 24 did not return for Session 2 (8 = unwarned; 16 = warned), one had already completed the study previously, and one did not follow headphone instructions. Of the 213

participants who returned for Session 2, two failed to recall the same memory from Session 1, one did not follow headphone instructions, and, due to a technical error, one completed the wrong survey. Thus, 209 participants completed Sessions 1 and 2. Participants were predominantly female (80.9%), with an age range of 17–50 ($M = 22.20$, $SD = 6.30$); 45.9% were White/Caucasian/European, 23.4% were Asian, 11.5% other (unspecified, mixed-race, African, Middle Eastern, Hispanic), and 19.1% specified nationality ("Australian").

We departed from our pre-registered design and planned analyses.[2] We conducted a post-hoc sensitivity analysis to assess the power of our final sample ($n = 209$) for 2 (Session 1 warning condition: warned, unwarned)× 2 (Session Time: Session 1, Session 2) mixed ANOVA analyses. We found that our sample was adequate to reliably identify a small-medium effect size ($f = 0.19$) for an alpha level of 0.05, and a desired level of power = .80 (Faul et al., 2009). Therefore, our sample size was adequate to detect our main interaction finding related to Impact of Event Scale Scores (small-medium $\eta_p^2 = .036$; in G*Power, $f(U) = 0.19$).

Materials

Warning message. In the *warning present* conditions participants saw a warning message on screen and simultaneously heard it as audio (via headphones):

> Warning: This study involves recalling a negative personal experience. Some people find this process distressing. For example, you may experience negative mood and intrusive mental images. A small minority of people also experience distressing memories and reactions in the week after recalling negative events, although these reactions generally subside quickly. Please do not proceed if you do not want to take part in this task or think that you may be adversely affected by this task.

Participants warned in Session 2 also received this message, prefaced with: "*We wish to remind you.*"

Recall task. In Session 1, we asked all participants to recall a negative event (see https://osf.io/2h6nw/ for full instructions) they had experienced in the past two weeks (Takarangi & Strange, 2010; see https:// https://osf.io/c6ubd/ for the full text responses with identifiable information redacted). In Session 2, participants recalled and wrote about this same event.

Positive Affect Negative Affect Schedule (PANAS; Watson et al., 1988**).** Participants rated how they felt in the current moment on 10 Positive Affect (e.g., present study: interested; $a = .91–.93$) and 10 Negative Affect (e.g., upset; $a = .88–.91$) items (1 = very slightly or not at all, 5 = extremely). Scores are summed for each subscale.

Six-Item short form of the State Scale of the Spielberger State-Trait Anxiety Inventory (STAI; Marteau & Bekker, 1992**).** Participants rated how they felt in the current moment (1=Not at all, 4 = Very much; present study: $a = .82–.85$) on three anxiety-present (e.g., "I am worried") and three anxiety-absent items (e.g., "I feel calm"; reverse scored). Scores for each item are summed to form a total state anxiety score.

Memory phenomenology. Participants rated their negative memory on a range of phenomenological characteristics. We selected items that would help us understand how a trigger warning may distort the way an autobiographical event is retained in memory and therefore if the memory would share more characteristics with a "triggered" intrusive memory for trauma. Traumatic intrusions reportedly have a sense of "nowness" as if they are currently happening (captured by our questions relating to *reliving, vividness, emotional intensity* and *sensory details*; Hackmann et al., 2004), are highly accessible and are thought and talked about more than low-intensity memories (captured by our *accessibility* and *rehearsal* items; Berntsen, 1996), and are recalled as fragmented isolated details rather than a coherent narrative (captured by our *content* and *coherence* items; Talarico & Rubin, 2003). Lastly, recent and highly emotional memories are more likely to be visualised via a person's own eyes (D'Argembeau et al., 2003), and memories recalled from a visual perspective matching how the event is stored in memory enhances believability (captured by our *imagination perspective* items; Marsh et al., 2014).[3] To simplify the analyses, we combined and averaged items measuring related concepts based on categories: *reliving* (4-items based on Rubin et al. (2019): reliving the event, travelling back to the time it happened, and feeling the same emotions; present study; $a = .75–.80$); *imagination perspective* (4-items based on Rubin et al. (2019): believing the memory was real vs. imaginary, remembering the event vs. just knowing it happened, whether the memory has details specific to my life vs. general, seeing event from own eyes vs. outside observer; $a = .56–.68$); *vividness* (5-items based on Rubin et al. (2019): how vivid and clear is the memory, while remembering the event I can see/hear/smell/hear people talking; $a = .66–.76$); *content* (2-items based on Rubin et al. (2019): I know the setting/location of actions; $a = .74–.76$), time (2-items based on Sutin and Robins (2007): my memory for the day/hour the event took place is clear; $a = .56–.65$), *emotional intensity* (6-items based on Sutin and Robins (2007): while remembering the event/my emotions at the time were positive (reverse scored), while remembering the event/my emotions at the time were negative, while remembering the event my emotions I feel are intense, while remembering the event I had a physical reaction; $a = .75–.77$), *rehearsal* (3-items based on Talarico and Rubin (2003): the event has come to me out of the blue without trying to think of it, I have thought/talked about this event since it happened; $a = .59–.74$); *accessibility* (5-items based on Sutin and Robins (2007): e.g., this memory sprang to mind when I read the instructions; $a = .74–.82$; *coherence* (6-items based on Sutin and Robins (2007): e.g., my memory comes as a coherent story/in pieces(reverse scored)/in words, the order of actions/events is clear; a

= .76–.78; see supplementary materials for full items: https://osf.io/kt8ap/). All items were rated on a 1–7 scale with higher scores indicating higher levels with one exception. We also asked about *sensory details* (5-items: does your memory contain sensory details? (yes/no) visual, auditory, olfactory, tactile, gustatory).

Centrality of Events Scale (CES; Berntsen & Rubin, 2006**).** This 20-item questionnaire is designed to measure the centrality of a negative event for a person's identity and life story (i.e., a single factor that represents the extent a negative event is employed as a reference point for the organisation of other mundane general life experiences and meaning). Participants rated items (e.g., "I feel that this event has become part of my identity") in relation to their negative memory (1 = totally disagree to 5 = totally agree; present study: a = .94–96). Scores are summed to form a total Centrality of Events score. Correlations between CES and PTSD symptomology in the present study (assessed by the Impact of Events Scale) were rs = .52–.59, $ps < .001$.

Impact of Events Scale Revised (IES; Weiss, 2007**).** This 22-item questionnaire measures the emotional impact of stressful life events based on the DSM criteria for PTSD. Participants rated (0 = not at all, to 4 = extremely) how often they were distressed or bothered in the past seven days by a range of reactions (e.g., I had trouble staying asleep; present study; a = .94–.95). Scores are averaged and can be scored as a single factor, or as three subscales—avoidance, intrusions and hyperarousal.

Ways of Coping (Revised; Folkman & Lazarus, 1985**).** Participants rated the extent to which they engaged in a range of coping strategies for the negative event they recalled (e.g., [c]hanged or grew in a person in a good way; 0 = not used, to 3 = used a great deal) forming 8 subscales developed from a community sample measuring a range of stressful experiences (Folkman et al., 1986): confrontive coping (6-items: present study; α = .65–.74), distancing (6-items: α = .65–.72), self-controlling (7-items: α = .57–.66), seeking social support (6-items: α = .78–.80), accepting responsibility (4-items: α = .67–.74), escape-avoidance (8-items: α = .77–.81), planning and problem-solving (6-items: α = .69–.76) and positive reappraisal (7-items: α = .78–.81). Items are summed to form each subscale.

Procedure

Session 1. Figure 1 depicts the procedure. The experiment (including all questionnaires etc.) was run using Qualtrics software (Provo, UT). We told participants we were interested in the relationship between autobiographical memory and personality. All participants were told that they would be asked to recall a negative autobiographical experience but were not told that this experience would be distressing. Following consent, participants completed initial measures of mood (PANAS) and state anxiety (STAI). We randomly allocated them to the warning or control (no warning) condition. Participants in the warning condition saw a warning message at this time, followed by demographic questions, and mood and anxiety measures a second time. The participants in the control condition only completed the demographic questions at this time. All participants completed the recall task and rated the phenomenological characteristics of their memory, followed by how central the memory felt to their identity (CES), coping strategies (WCS), and the emotional impact of the event (IES) in a randomised order.

Session 2. Participants returned two weeks after Session 1 at the same time (we allowed a 24-hour grace period before or after the scheduled return time—used by nine participants). The procedure was identical to Session 1 except participants recalled the same event that they recalled in Session 1. To address an exploratory aim about the possible accumulative effects of warning messages, we re-randomised participants again to either receive a second warning or no warning. We then fully debriefed and paid participants \$25AUD (n = 98) or granted course credit (n = 111).

Results

Statistical overview

Full descriptive and inferential statistics appear at: https://osf.io/7j5us/. Some measures were skewed and not normalised by transformations, so we have analyzed untransformed data. However, where variables violated homogeneity tests we ran analyses using transformed and untransformed scores and report changes in statistical patterns. For some measures, Box's Test of Equality of Covariance Matrices was significant, but because group sizes were similar we assumed Pillai's Trace to be stable (Field, 2005). All test statistics remained unchanged when corrected using Pillai's Trace.

To investigate our predictions that warned participants would experience a negative anticipatory period prior to completing the memory recall task (i.e., increases in negative mood and anxiety, and decreases in positive mood, from pre-to post-warning message), we conducted several paired samples t-tests; specifically, we compared mood measures (PANAS) and state anxiety measures (STAI) from pre- to post trigger warning presentation. For our main hypotheses that participants given a trigger warning (vs. no warning) would report more negative memory characteristics (e.g., greater sense of reliving the event, greater emotional impact) in Session 1, and that participants who received a warning in Session 1 would report a smaller decrease in negative characteristics over time (or possibly an increase in negative characteristics), compared to unwarned participants, we conducted several 2 (Session 1 warning condition: warned, unwarned)× 2 (Session Time: Session 1, Session 2) mixed ANOVA analyses.
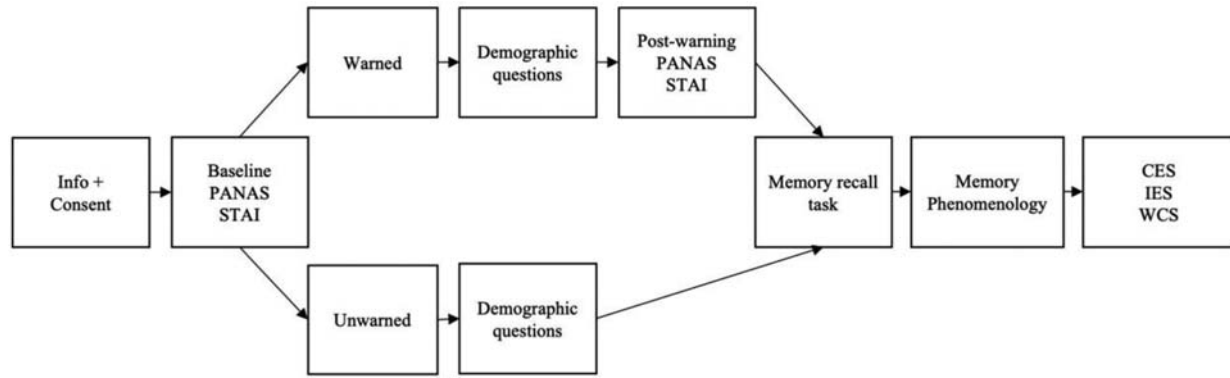
Figure 1. Chart depicting the procedure of Session 1 and Session 2.

Did the warning lead to a negative anticipatory period prior to the recall task?

We first confirmed that in *Session 1*, mood and anxiety ratings were not significantly different prior to randomisation for participants in the warned and unwarned conditions. They were not (see Table 1; $ts = 0.77–1.46$, $ps = .145–.442$). We next compared mood and anxiety before and after the warning message in *Session 1*. In Session 1 the warning appeared to cause a negative anticipatory period: participants reported decreased positive affect ($t(105) = 4.99$, $p < .001$, $d_z = 0.48$, 95% *CI* [0.28, 0.68]) and increased state anxiety ($t(105) = -2.11$, $p = .037$, $d_z = -0.20$, [-0.39, -0.01]) from pre- to post-warning message. However, participants reported similar negative affect from pre- to post-message ($t(105) = 1.14$, $p = .259$, $d_z = 0.11$, [-0.08, 0.30]).

In *Session 2*, we examined if participants' mood and anxiety scores prior to randomisation into Session 2 warning conditions were influenced by their previous warning experience in Session 1. For instance, perhaps the previous feelings of anxiety and decreased positive affect returned to them when they were about to start the experiment at Session 2. However, the previous Session 1 warning did not seem to influence Session 2 anxiety prior to Session 2 condition randomisation ($t(207) = 0.94$, $p = .346$, $d = 0.13$), positive affect ($t(207) = -1.92$, $p = .056$, $d = 0.26$), or negative affect ($t(207) = -0.40$, $p = .687$, $d = 0.06$). In sum, the warning message

appeared to cause a negative anticipatory period prior to the recall task in Session 1.

Characteristics associated with the memory

To examine the immediate effects of the warning message on memory recall (in Session 1) as well as how it may have affected the recall of the memory over time (in Session 2) we ran several 2 (Session 1 warning condition: warned, unwarned) × 2 (Session Time: Session 1, Session 2) mixed ANOVAs (full descriptive statistics in Table 2 and full inferential statistics Table 2 in the supplementary materials: https://osf.io/7j5us/). To investigate our predictions concerning the effects of the warning message on immediate and delayed recall, we applied a family-wise Holm–Bonferroni correction (for a total of four comparisons) for the results of each ANOVA to account for; (1) the main effect of Session 1 warning condition, (2) the interaction between Session 1 warning condition and Session Time, and any subsequent pairwise comparisons between (3) the effect of Session 1 warning condition in Session 1, and (4) the effect of session 1 warning condition in Session 2. Because we believed that time, as well as the act of completing the questionnaires would have an overall healing effect (a main effect of Time regardless of warning conditions) we did not include pairwise comparisons related to the change in each warning condition over Time in this correction.

Table 1. Summary of mean positive affect, negative affect and state anxiety ratings prior to randomisation into warning conditions and pre- to post-warning message.

		Warned (*n* = 106)		Unwarned (*n* = 103)	
Session 1 warning condition		*M*	*SD*	*M*	*SD*
Prior to randomisation into warning conditions in Session 1	Positive affect	25.57	7.49	26.43	8.66
	Negative affect	16.18	6.07	15.50	5.90
	Anxiety	12.92	3.28	12.18	3.99
Post-warning Session 1	Positive affect	24.27	8.21	-	-
	Negative affect	15.89	6.27	-	-
	Anxiety	13.33	3.63	-	-
Prior to randomisation into warning conditions in Session 2	Positive affect	23.47	8.24	25.66	8.20
	Negative affect	15.17	6.01	15.51	6.35
	Anxiety	12.38	3.86	11.86	4.00

Note: Positive Affect scale range 10–50, Negative Affect scale range 10–50, State anxiety scale range 6–24.

Table 2. Summary of ANOVA results for 2 (Session 1 warning condition: warned, unwarned) × 2 (Session Time: Session 1, Session 2) mixed ANOVAs for memory characteristics and coping strategies.

| | | | Session 1 | | | | Session 2 | | | |
| | | | Warned[a] | | Unwarned | | Warned | | Unwarned | |
Session 1 warning condition		Scale range	M	SD	M	SD	M	SD	M	SD
Phenomenology	Reliving	1–7	5.13	1.16	4.96	2.13	4.07	1.36	3.67	1.35
	Imagination perspective	1–7	5.94	0.95	5.99	0.79	5.28	1.21	5.16	1.15
	Vividness	1–7	4.59	1.10	4.53	0.98	3.98	1.24	3.65	1.08
	Content	1–7	6.29	1.02	6.16	0.81	5.82	1.29	5.57	1.14
	Time	1–7	5.27	1.39	5.26	1.27	4.25	1.52	4.19	1.43
	Emotional intensity	1–7	5.69	0.93	5.64	0.94	5.06	0.99	4.91	1.05
	Rehearsal	1–7	4.21	1.28	4.09	1.32	3.37	1.34	3.00	1.29
	Accessibility	1–7	5.71	1.08	5.55	1.26	4.90	1.50	4.80	1.30
	Coherence	1–7	5.02	1.13	4.99	0.98	4.18	1.23	3.84	1.18
CES		20–100	48.92	18.45	47.74	18.86	44.02	20.09	39.95	18.42
IES	Avoidance	0–4	1.58	0.89	1.52	0.87	1.28	0.94	1.05	0.87
	Intrusions	0–4	1.62	1.04	1.67	1.07	1.00	0.97	0.79	0.87
	Hyper-arousal	0–4	1.26	1.01	1.31	1.05	0.83	0.89	0.65	0.81
	Total	0–4	1.49	0.87	1.50	0.88	1.05	0.85	0.84	0.78
WCS	Confrontive coping	0–18	4.73	3.22	5.11	3.66	4.17	3.39	4.83	3.93
	Distancing	0–18	6.58	3.55	7.00	3.97	6.79	3.75	7.07	4.25
	Self-controlling	0–21	8.12	3.84	8.38	3.87	7.66	4.24	7.15	3.95
	Seeking social support	0–18	6.72	4.36	5.99	4.32	6.04	4.41	5.79	3.91
	Accepting responsibility	0–12	4.32	3.21	4.46	2.99	3.76	3.08	3.91	3.10
	Escape-avoidance	0–24	7.08	4.86	7.54	5.34	6.57	5.41	6.56	5.10
	Planful problem solving	0–18	6.18	3.57	6.96	3.98	5.81	3.74	6.53	4.10
	Positive reappraisal	0–21	4.40	3.58	4.50	4.62	4.23	3.96	4.56	4.67

[a]For one participant, Qualtrics failed to display the CES and some WCS items so some subscales could not be calculated (Self-controlling, Escape-avoidance, and Positive-reappraisal). Therefore, this participant was excluded from these analyses.

Healing effects of time

Before examining our main predictions in relation to the warning conditions, we first examined if there was an overall "healing" effect of time (i.e., decrease in negative reactions from Session 1 to Session 2) regardless of warning. As expected, the main effect of Session Time (Session 1, Session 2) was significant for all memory characteristics, ratings of event centrality, scores on the IES total (and subscales) reduced significantly over time ($Fs = 46.61$–198.34, $ps < .001$). Therefore, consistent with prior research, characteristics associated with recalling the negative events (e.g., phenomenological experiences, emotional impact, and event centrality) faded over time.

Did the warning change immediate recall experiences?

Despite the warning message creating a negative anticipatory period prior to memory recall in Session 1, no pattern of results shows support for the idea that the warning message made immediate recall experiences more negative. Additionally, the Session 1 warning did not seem to change recall experiences across the whole study, regardless of time—that is, there were also no main effects for Session 1 warning condition ($Fs < 4$, $ps > .05$).

Did the warning message distort delayed recall?

We next examined if the warning changed the way participants recalled the event over time. A significant interaction emerged between Session Time (1, 2) and Session 1 warning condition (warned or unwarned) for Impact of Event Total scores ($F(1, 207) = 7.76$, corrected $p = .024$, $\eta_p^2 = .036$). Follow-up simple effects tests revealed no significant differences in Session 1 for participants who were warned versus unwarned in Session 1 ($F(1,207) = 0.93$, corrected $p > .999$, $d = -0.01$, 95% CI [−0.28,0.26]) or Session 2 ($F(1,207) = 3.49$, corrected $p = .252$, $d = 0.26$, 95% CI [−0.01, 0.53]). The interaction appears to be driven instead by how the warning changed participants' scores over time. That is, IES total symptoms subsided *more* over time when participants were not warned in Session 1 ($F(1,207) = 136.86$, $d_z = 1.12$, [0.87, 1.36]) versus when they were warned ($F(1,207) = 62.39$, $d_z = 0.79$, [0.57, 1.02]). This finding suggests that the warning did indeed hamper the healing nature of time.

Contrary to predictions, there were no other interactions between Session 1 warning condition and Session Time for any other memory characteristics ($Fs < 3$, $ps > .05$). There were also no significant differences in the reporting of sensory characteristics (Y/N) for warned and unwarned participants in Session 1 or Session 2 (See https://osf.io/7j5us/). Thus, although warned—versus unwarned—participants did not experience more negative memory phenomenology, or perceive greater emotional impact, and event centrality *in Session 1*, consistent with our hypothesis, warning participants in Session 1 did result in a *smaller decrease* in some memory characteristics over time.

Coping strategies

The reported use of all coping strategy subscales reduced significantly over time ($Fs = 4.34$–17.28, $ps < .001$–$.038$),

except for the distancing ($F = 0.44$, $p > .05$) and positive reappraisal ($F = 0.08$, $p > .05$) subscales. Likely as negative characteristics of the memory faded, so too did the need for coping behaviours. However, the warning had little impact on the coping strategies participants reported: we did not find any main effects for Session 1 warning condition or interactions between Session 1 warning condition and Session Time ($Fs < 4$, $ps > .05$).

Accumulative effects of warnings

Related to our second exploratory aim regarding the possible accumulative effects of warnings, we examined whether negative anticipatory effect of warnings accumulates over time as more people encounter an additional warning (see OSF for full descriptive statistics). Like Session 1, in Session 2 participants reported decreased positive affect ($F(1,103) = 9.46$, $p = .003$, $\eta_p^2 = .084$, $d_z = 0.30$, 95% CI [0.10, 0.50]) and increased state anxiety ($F(1,103) = 7.19$, $p = .009$, $\eta_p^2 = .065$, $d_z = -0.26$, [-0.46, -0.07]) from pre- to post-warning message. Again, participants' negative affect did not change ($F < 1$, $p = .461$, $d_z = 0.07$, [-0.12, 0.26]). There were no significant interactions between Session 1 warning condition and time (pre- vs. post-warning in Session 2; $F = 0.31–1.62$, 1, $ps = .206–.581$). Interestingly however, and in support of the idea that the negative effects of warning messages may accumulate, participants who were also warned in Session 1 reported lower overall positive affect than participants who were not also warned in Session 1. In other words we found a main effect of Session 1 warning condition among subjects who were also warned in Session 2 ($F(1,103) = 7.08$, $p = .009$, $\eta_p^2 = .064$). However, the main effect of Session 1 warning condition was not significant for negative affect ($F(1,103) = 0.39$, $p = .531$, $\eta_p^2 = .004$), or state anxiety ($F(1,103) = 3.55$, $p = .062$, $\eta_p^2 = .033$). We also found no results suggesting warnings had accumulative effects on any of our other measures (see https://osf.io/x6t7v/ for full details).

Discussion

Here, we investigated if it was possible for a warning message to distort the negative characteristics associated with the immediate and delayed recall of a negative event. We also explored whether warnings would change the strategies people used to cope with recalling the event. While the warning message caused a negative anticipatory period prior to the recall task, it did not change the way that people initially recalled their negative event (i.e., in Session 1). However, the warning message did appear to distort delayed recall experiences and hamper some of the healing effects of time. Ratings of event impact subsided less over the two-week delay for participants who heard a warning message in Session 1. Importantly, we did not find any evidence that warning messages were helpful in reducing negative

emotional reactions or promoting the use of coping strategies.

Consistent with prior work (e.g., Bridgland et al., 2019), viewing the warning message in Session 1 (and in Session 2) led to a negative anticipatory period marked by increases in state anxiety and decreases in positive affect prior to the recall task. While we did not find an increase in negative affect from pre- to post-warning message, it is not uncommon for positive and negative affect to fluctuate independently (Crawford & Henry, 2004). Indeed, in Bridgland et al., we observed increases in negative affect, and no significant changes in positive affect, from pre- to post-warning message. The differences may be explained by the differences in study stimuli. In Bridgland et al., participants were warned prior to viewing a series of potentially distressing photographs. The aversive state provoked by this kind of message may be more related to fear of the unknown and thus better measured by negative affect, which is associated with states such as fear and nervousness (Watson et al., 1988). In the present study, participants were asked to recall a past experience and thus were not faced with the unknown. However, lower positive affect is associated with feelings of *sadness* (Watson et al., 1988)—a feeling that might be likely when recalling a negative past event.

Although the warning did not have any immediate effects, differences emerged after the two-week delay, suggesting that receiving the warning message in Session 1 had impact *that was only observable over time*. Our data fit with the idea that the negative anticipatory period became associated with *the act of recalling* the negative memory, therefore affecting delayed but not immediate recall. This possibility seems especially likely because we found evidence that participants who were warned in Session 1 experienced lowered positive affect throughout Session 2—even prior to the Session 2 tasks (e.g., while waiting for the experiment to begin). Thus, perhaps these participants were already anticipating the negativity of the recall task. However, we acknowledge that a limitation of this interpretation is that it was not possible to obtain a true baseline measurement of mood. Therefore, it is possible participants in the warning in Session 1 condition were in a more negative mood by random chance at the beginning of Session 2 due to natural variation (e.g., feeling negative due to other factors unrelated to the experiment).

A possible reason why warnings do not ameliorate negative affect may be because they do not appear to enhance the use of coping strategies to cope with negative events. Despite theorising that warnings may increase avoidance behaviours, and despite claims that warnings help people to use coping strategies, we found no evidence for this idea. Moreover, no participants decided to exit the study at the point of viewing the warning message—showing the warning did not seem to promote complete situation selection avoidance behaviours. However, twice as many participants we warned

in Session 1 ($n = 16$; unwarned, $n = 8$) did not return for Session 2. Perhaps these participants did maintain a higher level of IES symptoms regarding their negative event and thus did not wish to take part in Session 2 and have to recall and answer questions about their negative event again.

The data also suggest that warning messages could be considered a source of misinformation/feedback (e.g., Takarangi & Strange, 2010), and are capable of distorting how people perceive memories after a delay. In addition, our findings make a novel contribution to the nocebo literature by showing that anticipatory information may manifest as distress associated with memories over time. These findings are important because no published research has examined the effects of warning messages beyond a single experimental session.

There are several limitations. First, event impact ratings (measured by the IES) were quite low—meaning the effect of the warning message on these ratings was also small—likely because we asked participants to recall a negative event that occurred within the past two weeks. However, it is worth noting that even over this constrained period, 13.6% of our sample (13.2% unwarned in Session 1 and 14.0% warned in Session 1) reported an event that might be classified as Criterion A (actual or threatened death or serious injury; e.g., sexual assault, physical assault, loss of a loved one). Given that around 90% of people have experienced at least one lifetime traumatic event (Kilpatrick et al., 2013), it is likely that the effects observed here may be magnified when targeting lifetime traumatic events or populations with clinical levels of PTSD.

Second, many of the effects we observed were small. However, while small effects may not be very consequential in a single episode, they may matter in the long run (Funder & Ozer, 2019). This consideration may be especially important for warnings that are becoming increasingly prevalent in everyday life. Consider one setting: an average adult spends three hours and 30 min per day on a mobile device (Molla, 2020), equating to 53 full days a year, viewing thousands of online posts and articles, a proportion of which contain trigger warning messages. Over time, small negative effects caused by warning messages, such as anticipatory anxiety (Bridgland et al., 2019), enhanced event centrality (Jones et al., 2020), and memory distortion, may accumulate and have large consequences. Previous work on warning messages has only used single measurement designs and focused on the short-term effects. Our results highlight that although warnings do not always have immediately observable effects, warnings may change emotional responses over time. Indeed, if we had obtained measurements from a third time point, a month after the initial session, we may have observed further effects. Lastly, it is possible the wording of the warning message itself (i.e., "*negative mood and intrusive mental images*") may have related most strongly to the intrusion and hyperarousal scales of the IES. This feature of the warning may explain why the

warning inhibited "healing" over time for the IES but not for other measures. Therefore, it is necessary for future research to examine warnings that emphasise different negative outcomes and use different wording.

Third, because we did not obtain a second measure of mood and state anxiety in the no warning condition, it is possible that the decreases in positive affect we observed in the warned condition from pre to post-warning reflect a general decrease over time—perhaps due to a natural decrease in positive arousal due to sitting in a laboratory room—rather than attributable to the warning message itself. However, because the warning is only 40 s in length and participants completed only three demographic questions before the second measure of mood and anxiety, it seems unlikely that participants' positive affect would have deteriorated much in such a short lapse of time. Furthermore, this explanation does not account for the increase in state anxiety also reported by warned participants from pre- to post-warning message —suggesting that the warning message did cause some levels of genuine negative affect. Nevertheless, future research should consider this limitation, perhaps by providing neutral instructions matched to the length of the warning message in the unwarned condition.

Fourth, the Cronbach's alpha for some of the memory phenomenology subscales were low, suggesting poor internal consistency. This pattern is perhaps because we assembled our own set of items from several memory questionnaires—as is customary for research using items from the Autobiographical Memory Questionnaire—and therefore the questionnaire does not have a validated factor structure. In future, it would be beneficial to validate the factor structure of our questions prior to conducting any follow-up experiments.

In summary, this study is the first to examine the effects of warning messages on the recall of personal memories (rather than novel stimuli) with two important findings: first, we found that warning messages seem capable of prolonging aversive aspects of a negative event. Second, if we turn to what we *did not* find, warnings do not seem to diminish the distress associated with recalling a negative memory or increase the reported use of coping strategies. These data have important implications for renewed calls to use trigger warnings to improve mental health by adding to the growing body of evidence that trigger warnings at best may have trivial effects or at worst cause harm. Further, our results have implications for trauma researchers and clinicians who use warnings as part of informed consent procedures. In a sample of 180 ProQuest dissertations that contained one or more of nine trauma related terms (e.g., disaster), over one third of the consent documents suggested participation would be moderately to *severely* distressing (Abu-Rus et al., 2018). Further, recommended practice for exposure therapy is to make patients aware of possible risks (e.g., distress and temporary symptom exacerbation when repeatedly recalling the traumatic memory; Altis et al.,

2014). However, our results suggest that by setting up the expectation of risk, this consent ritual may actually be a source of harm (Loftus & Teitcher, 2019).

Notes

1. These conditions were collapsed for our main analyses, but we report key findings here (below) and full results can be found at: https: https://osf.io/x6t7v/

2. We originally planned to analyse our dependenat variables using a 2 (Session 1 warning condition: warned, unwarned) × 2 (Session 2 warning condition: warned, unwarned) × 2 (Session Time: Session 1, Session 2) mixed design. We conducted an a priori power analysis for a 4 (between) × 2 (within) repeated measures ANOVA with the smallest effect size we would be interested in (f = .15), power of .95, and r = .48, based on a prior correlation between repeated measures of emotion about a recent negative event (Takarangi & Strange, 2010). The recommended sample size was 204. We calculated this power analysis because G*Power does not have the capability to calculate power for mixed designs beyond a single between subjects' level. However, a previous reviewer rightly pointed out that we were likely therefore underpowered for a 2 (between) × 2 (between) × 2 (within) subjects design. While we could have analysed our variables using 4 (between) × 2 (within) subjects' analyses, we do not believe this analysis reflects the true nature of our design, because participants are only in two groups (warned or unwarned) in Session 1. Additionally, the repeated warning in Session 2 was a secondary interest. Therefore, we reframed our analyses to focus on the effects of the Session 1 warning condition and analysed our variables using a 2 (Session 1 warning condition: warned, unwarned) × 2 (Session Time: Session 1, Session 2) design, collapsing the Session 2 warning condition. This change allowed us to reach suitable power. We report the analyses of the full 2 × 2 × 2 design here: https://osf.io/x6t7v/, and report any notable findings related to our secondary aim regarding the accumulative effects of the warning message for participants warned in Session 1 and Session 2 in our results section below.

3. When reconstructing events from autobiographical memory, a person's belief in the memory actually occurring (rather than being imaginary) is enhanced if the event is recalled from a visual perspective that matches how the event-related information is retained in memory (Marsh et al., 2014). Recent memories are more likely to be recalled from a first-person rather than a third-person perspective—therefore when recalling a memory from the past-two weeks, someone would be more likely to believe that it has really occurred if it is recalled from an observer (first person) versus field (third-person) perspective (Marsh et al., 2014).

Disclosure statement

No potential conflict of interest was reported by the author(s).

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