Social comparison modulates acute responses to traumatic footage and the development of intrusive memories

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Abstract
The psychosocial environment is pivotal for the adjustment to traumatic experiences, yet the role of social cognition in the development of post-traumatic stress disorder (PTSD) remains obscure. We theorize that comparison with other trauma survivors reporting high or low levels of stress-related symptomatology might attenuate or amplify the development of PTSD, depending on perceived similarities with the standard. 90 healthy participants viewed traumatic footage and read ostensible testimonials from a fellow participant from a similar background, reporting high levels of PTSD symptoms (i.e. a similar-vulnerable social comparator), low distress (similar-resilient) or by a demographically dissimilar person reporting low distress (different-resilient). A separate no-comparison group (n = 30) served to gauge the presence of assimilative responding. Relative to similar-vulnerable comparison, a similar-resilient comparator tended to attenuate acute negative affect, but this did not translate to a similar effect on seven-day intrusive memories. Here, the similar-vulnerable group tended to report fewer intrusive memories compared to control, indicating a contrastive response. Taken together, we provide preliminary evidence that social comparison modulates the adjustment to adversity, whereby acute affect and intrusion development may be influenced differentially.

Keywords
post-traumatic stress disorder, trauma film paradigm, social comparison, comparative processing model, self-evaluation, critical incident stress debriefing

Introduction
It has been estimated that about 60–70% of people encounter at least one potentially traumatic event in the course of their lifetime, including life-threatening accidents, violent crimes or natural disasters (Benjet et al., 2016; Darves-Bornoz et al., 2008). While most trauma survivors are able to adjust well to such experiences (Bonanno et al., 2011), a considerable proportion develop symptoms of post-traumatic stress disorder (PTSD), a debilitating condition that often takes a chronic course (e.g. more than half of those with PTSD do not remit within 40 months; Morina et al., 2014). The psychosocial environment plays a major role in how well people adjust to traumatic experiences (Brewin et al., 2000; Ozer et al., 2003; Trickey et al., 2012), and there has been an increasing interest in interindividual processes contributing to the development of PTSD (Maercker & Hecker, 2016). For instance, trauma survivors often rely on social feedback to interpret the severity of traumatic experiences or post-traumatic reactions (e.g. Spoont et al., 2009). Yet, sharing traumatic experiences and engendered complaints is not necessarily beneficial in reducing the risk of PTSD (e.g. Southwick et al., 2000) and can even interfere with psychological recovery (Lilienfeld, 2007; Paterson et al., 2015; Rose et al., 2003). While these findings highlight the critical role of the post-traumatic social environment, surprisingly little is known about the mechanisms that may link social cognition to the development of PTSD symptoms.
One of the most ubiquitous social processes that may modulate psychological adjustment to traumatic experiences is social comparison (Gerber et al., 2018; Hoppen et al., 2020). Social comparison refers to the process by which humans automatically relate other people’s characteristics and preferences to their own (Dunning & Hayes, 1996). It has been theorized as a means to process everyday information efficiently (Mussweiler & Epstude, 2009), generally serving the motives self-evaluation, self-improvement, and/or self-enhancement (Suls et al., 2002; Wood, 1996). Social comparison can be categorized as upward, lateral or downward – when the comparator is perceived as superior, similar or inferior, respectively. Moreover, the cognitive process of comparison may result in updating our self-evaluation, which can be described as assimilation or contrast relative to the comparison standard. That is, assimilation occurs when the comparison shifts one’s self-evaluation towards the comparison standard, whereas contrast occurs when one’s self-evaluation moves away from the comparison standard.

In a general comparative processing model of self-evaluation, Morina (2021) proposed that the effects of social comparison on motivational outcomes can be understood in terms of a basic comparison process, which involves the assessment of certain comparator characteristics in relation to one’s own characteristics, and the engendered comparison outcomes (i.e. perceiving oneself as superior, equal or inferior relative to a standard). Based on various empirical findings (e.g. McFarland et al., 2001), the model further suggests that the comparison outcome and its subsequent valuation is influenced by peripheral similarity (i.e. related to attributes beyond the comparison dimension, such as shared group membership). The valuation of the comparison outcome with respect to one’s goals and perceived coping abilities will then determine the emotional and cognitive responses to the comparison. Following a comparison of one’s resiliency, we can broadly distinguish three valuations and responses: a threat appraisal followed by a pessimistic response, a challenging appraisal followed by an optimistic response, and a consonant appraisal followed by a confident response (see Figure 1).

For example, trauma survivors who perceive themselves as inferior to a highly resilient fellow survivor, may appraise this comparison outcome as threatening, leading to pessimistic cognitions and an increase in negative affect and preoccupation about the traumatic event and its meaning. Alternatively, in some cases, this outcome may be appraised as a challenge, accompanied by optimism and the motivation to become more (or less) alike to the comparator. However, a challenging appraisal is much more likely if the comparison to a resilient social standard results in a self-as-equal compared to a self-as-inferior outcome. Similarly, when trauma survivors compare to a fellow survivor who suffers from PTSD, a self-as-superior outcome may be appraised as self-affirmative (e.g. that one is relatively well-off), helping them to down-regulate negative affect and reduce preoccupation with the trauma. However, a self-as-equal outcome relative to a fellow survivor with PTSD would be more likely to be appraised as threatening and thus be followed by increased negative affect. From these examples, it follows that comparisons to relevant comparators may change one’s self-evaluation of coping capability in an assimilative or contrastive manner, defined as a shift from a pre-comparison self-representation to posterior

Figure 1. Schematic comparison process model (adapted from Morina, 2021) with a fellow trauma survivor serving as the comparator. Panel A illustrates the basic comparison process resulting in an upward, lateral or downward outcome, driven by perceived resiliency and similarity of the comparator. Panel B illustrates cognitive and affective responses relevant for emotion regulation in response to the traumatic experience. As indicated by the arrows, comparator similarity should decrease the likelihood of negative affective reactions for highly resilient comparators, but increase it for highly distressed comparators.
self-representation towards the comparator (assimilation) or away from it (contrast). This shift in turn may influence subsequent affective responses.

An intriguing implication of this model is that manipulating the basic comparison process may offer a window to significantly influence the reinterpretation of a traumatic experience and one’s ability to cope with the memories, which may translate into adaptive emotion regulation processes such as perspective taking or harmful ones such as catastrophizing (Garnefski et al., 2002). Indeed, changing cognitions about an emotional situation (i.e. cognitive reappraisal) can be highly effective in regulating emotions (Webb et al., 2012) because it alters an early stage of emotion generation preceding the development of response tendencies (Gross & Thompson, 2007). Of note, the comparison outcome and its valuation cannot be manipulated directly, but are indirectly dependent on specific characteristics of the comparator (see Figure 1). Thus, it might be possible to induce an assimilative shift towards a highly resilient social comparator, which should positively influence the appraisal that one can cope well with difficult situations. Similarly, an attempt to induce assimilation to trauma survivors who do not cope well would be expected to be dysfunctional.

Based on these considerations, it is critical to establish the factors driving assimilation versus contrast when survivors of traumatic events compare their coping and well-being with other individuals. One of the most widely studied factors is the perceived similarity between the self and the comparison standard (Gerber et al., 2018; Mussweiler, 2003). Note that by perceived similarity, we refer to similarity on features that are related to the attribute to be evaluated. That is, trauma survivors may perceive similarity with a social standard if they share an identity relationship with the standard (e.g. age or group membership). Perceived similarity is suggested to enhance assimilation, while attention to differentiating characteristics between the comparator and the standard are thought to dampen assimilation or cause contrastive reactions (e.g. Mussweiler et al., 2000). The selective accessibility model (Mussweiler, 2003) postulates that the outcome of a comparison depends largely on a quick assessment of (dis)similarity at the beginning of the comparison process. Accordingly, when the individual initially focuses on signs of similarity with the standard, the process likely results in assimilation, whereas a focus on dissimilarity fosters contrastive reactions. Indeed, a recent meta-analysis on social comparison concluded that people generally prefer upward over downward comparisons and tend to respond in a contrastive manner, while more assimilative responses can be elicited when people are primed to search for similarities, for example, in a perceptual search task (Gerber et al., 2018).

Although social comparison has received considerable attention in other fields of psychology (Gerber et al., 2018), only a limited number of studies have investigated its role in PTSD symptoms (for review, see Hoppen et al., 2020). The available evidence, based on cross-sectional self-report measures, indicates that a more negative self-perception in comparison to others correlates with higher PTSD symptom severity (A. D. Brown et al., 2011; Hooberman et al., 2010; Morris et al., 2012; Troop & Hiskey, 2013). However, systematic research into the role of comparator characteristics (e.g. resiliency and similarity) and comparison outcome (e.g. self-as-inferior and self-as-superior) in the development of PTSD is still lacking.

Relevant insights come from an experimental study that addressed social feedback in healthy individuals who had seen a traumatic film (Takarangi et al., 2014). In particular, Takarangi et al. (2014) provided their study participants with ostensible testimonials from other participants, describing either a highly aversive impression of the film or downplaying the negativity of the film. Thus, these testimonials arguably represented highly vulnerable or highly resilient comparison standards, respectively. Since the feedback came from ostensible fellow participants (i.e. signalling similarity), our model would suggest that the vulnerable comparator would induce a threatening appraisal and more distress, whereas the resilient comparator would induce a challenging appraisal followed by lower distress (see Figure 1). Interestingly, Takarangi et al. found that relative to a third condition without feedback, only participants who read less negative testimonials (i.e. similar-resilient comparator) had reduced avoidance symptoms and a weakened sense of reliving associated with the memory, which suggests that assimilation with a resilient standard promotes adjustment to traumatic experiences. Notably, however, this study was primarily designed to optimize social feedback conditions for desensitization, cognitive restructuring, and/or memory distortion, rather than manipulate social comparison in a controlled manner (for a related approach, see also Lepore et al., 2004).

To investigate more systematically how comparison with more or less resilient individuals may interact with perceived similarity, we present an initial between-subjects experiment in which participants were exposed to traumatic footage and then read a single testimonial, purportedly written by another person who had viewed the same footage and had described their reaction to the traumatic footage. We then asked participants directly to evaluate their own impression and reaction to the film, compared to the testimonial. Crucially, we manipulated the level of PTSD symptoms that were described in the testimonial (none vs. a lot). Both resilient and vulnerable testimonials were ostensibly provided by a fellow student, in order to signal similarity and foster assimilative responses. Our first key hypothesis (H1) was that the similar-resilient comparison would lead to dampened affective reactions and lower levels
of intrusive memories compared the similar-vulnerable comparison. In a third experimental condition, the upward testimonial was ostensibly given by a professional paramedic of a different age, in order to signal dissimilarity. Our second key hypothesis (H2) was that following this different-resilient comparison, affective reactions and intrusion levels would be higher compared to the similar-resilient comparison. In addition, we also tested for differences between the different-resilient and the similar-vulnerable conditions on an exploratory basis, without formulating a specific hypothesis. Note that we did not include a separate different-vulnerable condition (i.e. for a full factorial design) based on an economical consideration of resource allocation for this initial study. In other words, this study was designed to address the effect of similarity only in comparisons with a resilient comparator, but not in vulnerable comparisons.

Notably, while the three experimental conditions were expected to have a differential influence on the affective responses to the comparison (see Figure 1), they cannot inform us about possible assimilation and/or contrast effects (i.e. whether participants updated their self-representation towards or away from the comparison standard), because it was not possible to measure a precomparison self-representation. Therefore, we additionally devised a no-comparison control group in order to gauge – on an exploratory basis – whether any of the conditions exhibits a shift in symptom development, relative to no social comparison. In other words, the no-comparison control group served as an approximation of people’s pre-comparison self-representation, as opposed to the post-comparison self-representations measured in the experimental conditions. Since we hypothesized a difference between the similar-resilient and similar-vulnerable comparison groups that would be driven by assimilation in opposite directions, we explored whether these two groups would have lower and higher levels of affective responses and intrusions, respectively, than the no-comparison control group. Meanwhile, the different-resilient group was theorized to display reduced or no assimilation, implying that a smaller or no difference with the control group can be expected.

Finally, we attempted to measure participants’ explicit knowledge of our manipulation (by having them guess the study’s purpose), as well as for individual differences in cognitive emotion regulation. This was done because some evidence suggests that social comparison has more pronounced effects when it is occurs automatically as opposed to following explicit instruction (Want, 2009). Furthermore, social comparison effects might be mediated by cognitive emotion regulation. For instance, the effects could be stronger in individuals who engage more frequently in cognitive reappraisal, because they may engage more deliberately with social comparison information in order to attenuate their emotional response. In particular, we assessed habitual use of cognitive reappraisal, since more frequent use of this strategy has previously been linked with dampened affective responses to emotional material (e.g. Meyer et al., 2012).

Materials and method

Participants

One-hundred twenty German-speaking participants (94 women, 25 men, 1 preferred not to say) with a mean age of 23.0 (range: 18–32 SD = 3.2) completed the study. They were recruited among the student population of University of Münster, using the following exclusion criteria: (a) recent treatment for psychological or psychiatric complaints, (b) psychoactive medication, (c) fear of blood, (d) history of trauma exposure, (e) more than 15 units of alcohol per week, (f) more than 1 unit of other drugs per week, (g) prior participants in trauma film studies and (h) present or past training as a paramedic or medical doctor. The criteria were established based on a self-assessment that was sent to candidates prior to inclusion. The self-assessment contained one item per exclusion criterion (yes/no), whereby affirmative responses automatically led to exclusion. No data was collected from excluded candidates. Two additional participants enrolled but did not complete the study and were therefore removed from all analyses. For ethical reasons, all participants were informed beforehand about the negative emotional nature of the film stimuli. All participants gave written informed consent and received partial course credits or a small financial compensation in return for completing the study. This study was approved by the ethical committee of University of Münster (approval number 2017-50-ThM).

Trauma films

Participants were shown five different clips depicting the aftermath of severe road accidents, each preceded by a brief audio description with background information about each situation. The compilation lasting about 15 min partly overlapped with film clips used by Steil (1997), extended and partly replaced with similar and more recent fragments. Each clip depicted seriously injured and/or dead victims of motor vehicle accidents being recovered from car wrecks and/or medically treated. German audio descriptions were inserted before each clip, matching the type of information provided in (Steil, 1997). Before watching the compilation, participants were provided with headphones and instructed to watch each clip attentively and without looking away, whilst imagining being a witness present at the scene. Similar to the procedure of prior studies (e.g. Meyer et al., 2016), an experimenter remained in the testing room during trauma film viewing, out of the participant’s sight, to ensure their
well-being and compliance. The experimenter refrained from discussing the content or emotionality of the film clips to minimize social influence unrelated to our manipulation.

**Social comparison**

In order to induce social comparison, participants were instructed to read a short verbatim report describing experiences and reactions to the video fragments, purportedly written by another participant a few days after watching the trauma films. In the similar-resilient condition (n = 30), the report was introduced as written by a fellow student from University of Münster of the same age and sex as the participant. It described an entirely resilient reaction to the film fragments, as well as the absence of PTSD-like symptoms in the following days. Meanwhile, the similar-vulnerable condition (n = 30) underwent the same procedure but read a report (matched in length) describing strong negative emotions in response to the film, as well as the development of disturbing intrusive memories in the following days. In the third, different-resilient condition (n = 30), participants read the same resilient and symptom-free report, but were told that it had been written by a 48-year-old paramedic who had 25 years of work experience.

Afterwards, participants were asked to make comparative judgements about their own feeling using two 200 mm Visual Analogue Scales (VAS). In particular, they were required to complete the statement ‘Compared to the person who wrote this report, I feel…’, with the anchors ‘−100 = much worse’; ‘0 = same’ and ‘100 = much better’. The second statement was ‘Compared to the person who wrote this report, I evaluate the film scenes as follows’: using the anchors ‘−100 = much more distressing’, ‘0 = same’ and ‘100 = much less distressing’. Both questions served to foster engagement of our participants in the social comparison. In addition, the responses served as a manipulation check for the degree of perceived similarity with the comparator. As intended, the two items were highly correlated with one another across conditions (r [N = 90] = .856, p <.001). We therefore aggregated the scores into composite comparison score by averaging them. Negative and positive values were expected for the upward and downward comparison conditions, respectively, whereby values closer to zero suggest stronger assimilation with the report.

**Affective responses**

The acute affective responses to the traumatic film and their modulation by the social comparison intervention were assessed with the Positive and Negative Affect Schedule – current state version (PANAS; Watson et al., 1988), consisting of two 10-item subscales measuring the current intensity of positive affect (PA; for example, alert, as > .75) and negative affect (NA; for example, afraid, as > .76) on 5-point Likert scales (1 = not at all; 5 = extremely). The PANAS was administered once before viewing the traumatic scenes (i.e. baseline) and after providing comparative judgements (i.e. post-manipulation). We refrained from administering the PANAS a third time in-between film viewing and the experimental manipulation as to not foster conscious preoccupation with our participants’ emotional reactions before they compared themselves to the report. Due to the aversive nature of the trauma film materials, our analyses focus on the NA subscale only.

**Intrusive memories**

The development of intrusive memories was monitored using a structured 7-days diary (Holmes et al., 2009; Meyer et al., 2019). Participants were required to record intrusions as soon as they occurred or their absence at least twice per day. For each intrusion, they were asked to note down the content and trigger (for verification), whether it had occurred in the form of a mental image, a verbal thought, or both, and to provide ratings of distress (0 = not at all; 10 = very) and clarity (0 = blurred; 10 = very clear). The frequency of intrusive memories was determined across all 7 days and was logarithm transformed prior to the analyses to correct for their right-skewed distribution. In the tables below, non-transformed frequencies are provided for better readability. For distress and clarity, respectively, we calculated average scores across memories, entering zeros if no intrusions had occurred, which was the case for N = 10 individuals (8.3%) in the present sample.

In addition, PTSD symptoms were measured retrospectively after one week using the revised Impact of Event Scale (IES-r; Maercker & Schützwohl, 1998). This scale requires respondents to indicate the frequency of stress-related symptoms on 22 four-point scale items. The total sum score (α = .86) indicates overall PTSD symptom severity and can be broken down into subscales for intrusions (e.g., ‘Any reminder brought back feelings about it’; α = .84), avoidance symptoms (e.g. ‘I stayed away from reminders about it’; α = .72) and hyperarousal symptoms (e.g. ‘I felt irritable and angry’; α = .67).

**Habitual emotion regulation**

A German translation (Abler & Kessler, 2009) of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) was included as a measure of habitual emotional regulation strategies. For the present study, the 6-item cognitive reappraisal subscale was of interest (α = .62; example: ‘I control my emotions by changing the way I think about the situation I’m in’). Items required a response on a 7-point scale (1 = strongly disagree, 7 = strongly agree). The ERQ also includes a second subscale measuring expressive suppression (4 items; α = .73) that is not further considered in the present paper.
Compliance, experimenter demand and explicit knowledge

At the end of the study, participants were asked whether they believed their own diary to accurately reflect the frequency of intrusive memories during the assessment week on a 100 mm VAS (0 = very inaccurate; 100 = very accurate). To measure possible experimenter demand effects, we then asked participants if they believed that having read another person’s report influenced their own reaction to the film fragments (0 = not at all; 100 = very much), and what they thought the influence was on intrusive memories (−50 = fewer intrusions; +50 = more intrusions). Finally, they were asked to write in 2–3 sentences what they believed the research question of this study was. The free responses were liberally coded as correct if there was any mention of the other person’s report or of comparison with other people, while all other responses were coded as incorrect. Correct responses were used as an approximate indicator of explicit knowledge about the study manipulation, which was present in 22 participants (18.3%). The ratio of participants with explicit knowledge did not differ between conditions, Chi-squared (3) = 2.44, p = .485.

Procedure

Participants were invited to two laboratory sessions separated by an interval of one week. In each session, they were seated in front of a desktop computer screen. All tasks and questionnaires were administered using Inquisit Lab (version 5). In session 1, participants first provided biographical data, completed the baseline PANAS and viewed the traumatic film fragments. Then, they were assigned to one of the three social comparison conditions or to the control condition in an automated manner (i.e. without the help or knowledge of the experimenter), based on a randomization list that was created before the start of the experiment. While the social comparison groups underwent the intervention, the no-comparison control group (n = 30) did not read any report and provided no comparative judgements and were instructed to sit quietly for 5 min. This phase was followed by administration of the second PANAS. Afterwards, they were handed the intrusion diary and received extensive oral instructions about its use. Upon return for the second session, participants handed in their diary, which was briefly checked for readability by the experimenter. Finally, they filled out the IES-r, the ERQ, as well as the items measuring compliance and demand effects.

Statistical analysis

Acute affective responses to the trauma film (i.e. increases in PANAS-NA scores) and the development of analogue PTSD symptoms constitute the main outcome variables. As in prior studies using the trauma film paradigm (James et al., 2016), PTSD symptoms are operationalized as the number of intrusive memories recorded in the one-week diary and PTSD total scores on the IES-r as convergent measures. We additionally explore effects on the separate IES-r subscales (intrusions, arousal and hyperarousal), diary intrusions per modality, and mean intrusion distress and vividness. Between-groups effects were addressed using independent-samples t-tests and analyses of (co-)variance (ANOVA). In particular, the data were analysed in two steps. First, we first performed hypothesis-driven comparisons between the similar-resilient and similar-vulnerable (i.e. H1; essentially addressing comparison direction, whereby a resilient comparator should lead to less NA and fewer analogue symptoms than a vulnerable comparator), and between the similar-resilient and different-resilient groups (i.e. H2; testing effects involving perceived similarity, whereby a resilient comparator should lead to less NA and fewer symptoms than a comparator that is perceived as different). Second, we explored differences between all experimental conditions and the no-comparison control group by means of omnibus ANOVAs, followed up by post-hoc t-tests. Alpha was set at .05 (two-tailed) for all analyses. In the post-hoc pairwise comparisons among the four conditions, a Bonferroni correction was applied for the four additional comparisons besides those addressing H1 and H2 (i.e. an uncorrected p-value < .0125 was considered statistically significant). To explore if correct guessing of the manipulation may have influenced the results, we repeated each analysis after removing participants who had some level of explicit knowledge (based on response to the open exit question). Based on effect sizes reported in prior studies using social feedback (f = 0.37 and 0.35 for avoidance and reliving experience in a study with three groups, Takarangi et al., 2014), we determined using G*Power (V3) that a sample size of 30 participants per condition was sufficient in order to detect effects of the size f = 0.36 in a one-way omnibus ANOVA with a power (1 – β error probability) of >.80 (actual power = .86). All statistical tests were performed using IBM SPSS (Version 25). The analysed dataset can be obtained via the Open Science Framework using the following link: https://osf.io/g5pcq/.

Results

Comparison scores

Hypothesis-driven tests. An independent-samples t-test on comparison composite scores (i.e. comparative current affect and judgement of the film, where values closer to zero indicate stronger assimilation) showed that, scores were positive in the similar-vulnerable condition (M = 42.6; SD = 27.9) and thus higher than in the similar-resilient condition (M = −37.7; SD = 23.9), t (58) = 12.0, p < .001, d = 3.09, in line with H1. Critically, however, there was no difference
between the similar-resilient and different-resilient groups (H2), \( t(58) = -1.3, p = .853, \eta^2_p = 0.05 \) (difference-resilient: \( M = -39.0; SD = 30.1 \)), meaning that (dis)similarity had no immediate effect on comparative ratings.

**Other group differences.** A one-way ANOVA comparing all three experimental conditions also showed a group effect, \( F(2,87) = 87.18, p < .001, \eta^2_p = .667 \), whereby post-hoc t-tests additionally revealed that the difference between similar-vulnerable and different-resilient condition was significant (\( p \) [Bonferroni] < .001). This is attributable to the fact that participants read a negative or a positive testimonial, respectively. These results essentially remained unchanged when participants with some level of explicit knowledge of the manipulation were removed\(^1\).

**Impact on acute negative affect (PANAS-NA)**

**Baseline differences.** Before addressing the hypotheses, we ran a one-way ANOVA to check for unintended group differences in baseline NA. No baseline group differences emerged, \( F(3,116) = 0.10, p = .961, \eta^2_p = 0.003 \).

**Hypothesis-driven tests.** Addressing H1, an independent-samples t-test on PANAS-NA increase (post-manipulation minus baseline) revealed non-significantly smaller NA increases in the similar-resilient condition (\( M_{\text{Increase}} = 6.3, SD = 5.5 \)) than the similar-vulnerable condition (\( M_{\text{Increase}} = 8.9, SD = 6.3 \)), \( t(58) = -1.8, p = .086, d = -0.45 \). Regarding H2, no difference emerged between the similar-resilient and the different-resilient group (\( M_{\text{Increase}} = 5.3, SD = 5.9 \), \( t(58) = 0.7, p = .513, d = 0.17 \)). Notably, when participants with some level of explicit knowledge were removed from the analyses, the difference between the similar-resilient and similar-vulnerable groups was significant (\( t(44) = -2.1, p = .039, d = -0.63 \)), in line with H1, with smaller increases in the similar-resilient condition (\( M_{\text{Increase}} = 6.4, SD = 5.7 \)) than the similar-vulnerable condition (\( M_{\text{Increase}} = 10.2, SD = 6.3 \)). The result for H2 remained unchanged in the smaller sample (\( p = .155 \)).

**Other group differences.** The omnibus ANOVA on NA increase including all experimental conditions and the control group yielded no group effect in the entire sample, \( F(3,116) = 2.37, p = .074, \eta^2_p = 0.058 \), whereas it did when participants with some level of explicit knowledge were removed, \( F(3,98) = 5.36, p = .002, \eta^2_p = .141 \). Pairwise comparisons revealed larger NA increases in the similar-vulnerable group compared to the different-resilient group (\( M_{\text{Difference}} = 5.9, SE = 1.5, p \) [Bonferroni] < .001). Moreover, the different-resilient group had smaller NA increases than the control group, although this difference fell short of statistical significance (\( M_{\text{Difference}} = -3.4, SE = 1.4, p \) [Bonferroni] = .074). PANAS-NA scores before and after manipulation in all groups are displayed in Figure 2.

**PTSD analogue symptoms**

**Hypothesis-driven tests.** Across the entire sample, participants reported 4.7 intrusions on average (SD = 3.6, median = 4; mode = 1; range = 0–19). Mean levels of PTSD analogue symptoms in all groups are summarized in Table 1. T-tests addressing H1 revealed no differences between the similar-resilient and similar-vulnerable conditions in terms of intrusion frequency, distress or vividness (all \( p > .30, ds < 0.27 \)). There also were no differences between these groups regarding IES-r scores (all \( p > .26, ds < 0.29 \)). Concerning H2, the t-tests yielded no significant effect for diary intrusion frequencies or intrusion distress between similar-resilient and the different-resilient groups (all \( p > .18, ds > -0.34 \)). However, the similar-resilient group had lower intrusion vividness ratings than the different-resilient group, \( p = .010, d = -0.69 \), in line with H2. The two groups also did not differ in mean IES-r total PTSD symptoms (\( p = .342, d = -0.25 \)). On the IES-r subscales, a significant difference emerged only for Hyperarousal symptoms (\( p = .036, d = -0.55 \)), with lower scores in the similar-resilient than in the different-resilient group.

**Other group differences.** The results of the omnibus ANOVAs involving all three experimental groups and the control group are summarized in Table 1. As can be seen, these analyses indicate a group effect only for the overall intrusion frequency and for mean intrusion vividness. For intrusion frequency, post-hoc pairwise comparisons indicate only one significant difference, with fewer intrusions in the similar-vulnerable group than in the no-comparison control group, \( p \) (Bonferroni) = .048. Meanwhile, the group effect involving intrusion vividness was carried only by the difference between the similar-resilient and different-resilient groups (i.e. H2) reported above, for all other comparisons \( p \) (Bonferroni) > .187.

Notably, when we repeated the analyses on PTSD analogue symptoms after excluding participants with some level of explicit knowledge of the manipulation, all of the effects reported above were reduced in size and exceeded thresholds of statistical significance (e.g. group effect on intrusive memories: \( F [3,98] = 2.05, p = .111, \eta^2_p = 0.059 \)), meaning that the findings summarized in Table 1 need to be regarded with some caution, as they may not be robust against the influence of explicit knowledge.

**Exploring discrepant condition effects on acute negative affect and intrusive memories**

In the findings reported above, a surprising pattern was that descriptively, the similar-vulnerable comparison group tended to have the strongest acute responses in terms of NA followed by the lowest number of intrusions. Notably, both effects were not very robust, such that statistically
significant differences in NA increase only emerged between the similar-vulnerable and the similar-resilient group, and significant differences in intrusions only emerged between the similar-vulnerable and the no-comparison control group. Still, this pattern could suggest a differential effect of social comparison on NA and intrusions.

To test whether this was indeed the case, we ran exploratory post-hoc hierarchical regression analyses on all main outcomes (i.e. diary intrusion scores and IES-r subscales). In the first step, we used NA increase (post-comparison minus baseline) as the sole predictor, since NA increases are known to be among the most reliable predictors of PTSD (analogue) symptoms (Clark et al., 2015). This allowed us to assess how much additional variance would be explained by adding the group main effect and the group × NA-increase interactions. In particular, in step 2, we added three dummy variables representing the different-resilient, similar-resilient and similar-vulnerable groups (i.e. the control group served as the reference), as well as three interaction terms (i.e. z-transformed NA-increase scores × group dummy). The results are summarized in Table 2. As can be seen, NA increase was a robust predictor of most intrusion-related outcomes. Critically, the similar-vulnerable comparison condition significantly attenuated this intimate relationship, such that individuals with stronger initial NA increase later developed fewer intrusive memories (relative to participants in the no-comparison control group). Put differently, we confirmed that the similar-vulnerable condition had a differential effect on acute NA increases and later development of intrusive memories.

### Potential influence of habitual reappraisal, demand and compliance

We found no unintended differences in reappraisal scores between the experimental conditions (p = .25). We also explored the possibility that our experimental

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**Table 1.** Mean (SD) PTSD analogue symptoms per experimental condition and in the control group.

| Measure          | Experimental group | Omnibus ANOVA |
|------------------|--------------------|---------------|
|                  | Similar-resilient  | Similar-vulnerable | Different-resilient | Control group | F (3,116) | \(\eta_p^2\) |
| Intrusions Any   | 4.0 (3.1)          | 3.5 (2.8)       | 5.1 (3.6)          | 5.9 (4.5)     | 2.73*     | .066       |
|                  | 3.7 (2.8)          | 3.0 (2.6)       | 4.2 (3.4)          | 4.6 (3.8)     | 2.22      | .054       |
| Thought          | 2.3 (2.5)          | 1.6 (2.1)       | 2.6 (3.0)          | 3.0 (3.0)     | 1.60      | .040       |
| Distress         | 2.6 (2.0)          | 2.3 (1.8)       | 2.8 (2.1)          | 3.2 (1.5)     | 1.17      | .029       |
| Vividness        | 4.4* (2.6)         | 4.8 (2.6)       | 6.1* (2.3)         | 5.2 (1.8)     | 2.70*     | .065       |
| IES-r Total score | 16.3 (10.9)        | 15.4 (10.6)     | 19.4 (13.9)        | 20.8 (15.3)   | 1.18      | .030       |
| Intrusions       | 7.5 (6.2)          | 5.9 (4.7)       | 9.0 (6.2)          | 9.5 (6.1)     | 2.34      | .057       |
| Avoidance        | 7.0 (4.6)          | 7.7 (6.7)       | 6.9 (7.1)          | 8.1 (7.1)     | 0.24      | .006       |
| Hyperarousal     | 1.8* (2.2)         | 1.7 (2.7)       | 3.4* (3.7)         | 3.2 (3.8)     | 2.46      | .060       |

*Note. Values denote means and standard deviations. IES-r = Impact of Event Scale – revised. "groups differ from one another at \(p < .05\), in line with H2. * \(p < .05\).
conditions may have interacted with habitual levels of reappraisal. To do so, we ran hierarchical regression analyses on each of the outcomes, predictors in the first step being ERQ reappraisal and three dummy variables representing the different-resilient, similar-resilient and similar-vulnerable groups (i.e. the control group served as the reference). In the second and crucial step, we entered the three interaction terms (i.e. z-transformed reappraisal scores × group dummy). This step did not significantly explain additional variance ($R^2_{\text{change}} < .06$, all $ps > .05$).

We found no differences between the three comparison groups in the degree to which participants thought that reading the other person’s report had in influence them, $F(2,87) = 2.13$, $p = .125$, $\eta^2_p = .047$ (overall $M = 22.5$, $SD = 18.8$) or in the direction of effect that such an influence would have, $F(2,87) = 0.70$, $p = .499$, $\eta^2_p = .016$, with a majority of 55 participants selecting zero as their reaction (overall $M = -6.8$, $SD = 17.3$). There were no additional effects when participants with explicit knowledge were removed from the analyses.

On average, participants indicated that their intrusion judgments among participants with a vulnerable comparator. However, higher similarity (i.e. fellow student vs. paramedic) did not generally alter the comparative ratings. Second, a similar-resilient comparator tended to attenuate negative affect relative to a similar-vulnerable comparator, as predicted (H1). Against expectations, the groups comparing to a similar- or different-resilient individual had similar levels of negative affect (cf. H2). Third, only few and subtle effects on intrusion-related measures were observed. Interestingly, participants comparing to a similar-vulnerable individual displayed the most pronounced reaction as more negative than the one described in the provided testimonial (as opposed to positive comparative judgements among participants with a vulnerable comparator).

Discussion
The current study examined the effects of comparison with similar and dissimilar others who display high or low levels of resilience, on the affective responses to traumatic video footage. Our main findings are as follows. First, both groups comparing with a resilient individual judged their own reaction as more negative than the one described in the provided testimonial (as opposed to positive comparative judgements among participants with a vulnerable comparator). However, higher similarity (i.e. fellow student vs. paramedic) did not generally alter the comparative ratings. Second, a similar-resilient comparator tended to attenuate negative affect relative to a similar-vulnerable comparator, as predicted (H1). Against expectations, the groups comparing to a similar- or different-resilient individual had similar levels of negative affect (cf. H2). Third, only few and subtle effects on intrusion-related measures were observed. Interestingly, participants comparing to a similar-vulnerable individual displayed the most pronounced reduction in intrusion symptoms compared to control, despite having had the most pronounced NA response initially. Taken together, our data lend initial support to the idea that

Table 2. Acute affective response (NA post–pre) and group interactions as predictors of intrusion symptoms.

| Measure | Beta coefficients | Model statistics |
|---------|-------------------|------------------|
|         | NA changea | Group | Group × NA change | |
|         |         | Sim-resilient | Sim-vuln | Diff-resilient | Sim-resilient | Sim-vuln | Diff-resilient | $R^2_{\text{change}}$ | $F$ |
| Intrusions Any | 1 | .234* | | | | | | | .055* | 6.81* |
|               | 2 | .600** | -.157 | -.338** | .028 | -.186 | -.347* | -.069 | .139** | 3.84*** |
| Image | 1 | .275** | | | | | | | .076** | 9.66** |
|               | 2 | .499* | -.175 | -.283** | .017 | -.073 | -.271 | -.001 | .111* | 3.68** |
| Thought | 1 | .106 | | | | | | | .011 | 1.33 |
|               | 2 | .444* | -.082 | -.285* | -.019 | -.129 | -.330* | -.110 | .091 | 1.82 |
| Distress | 1 | .355*** | | | | | | | .119*** | 17.03*** |
|               | 2 | .370 | -.109 | -.235* | -.023 | -.066 | -.109 | .214 | .107* | 4.86*** |
| Vividness | 1 | .061 | | | | | | | .004 | 0.43 |
|               | 2 | -.135 | -.165 | -.058 | .125 | .156 | .217 | .051 | .094 | 1.74 |
| IES-r Total score | 1 | .365*** | | | | | | | .133*** | 18.10*** |
| Intrusions | 1 | .349*** | | | | | | | .117* | 5.33*** |
| Avoidance | 1 | .292*** | | | | | | | .122*** | 16.34*** |
| Hyperarousal | 1 | .240*** | | | | | | | .134*** | 5.51*** |
|               | 2 | .726*** | -.113 | -.264* | .166 | -.352** | -.400** | -.066 | .085** | 10.97** |

Note. The no-comparison control group served as the reference in Model 2. Model 1 $df= 1118$; Model 2 $df= 7112$. NA = Negative Affect; IES-r = Impact of Event Scale – revised. *Model 2 coefficient for NA change is likely overestimated due to elevated collinearity (VIF >5).

a $p < .05$; ** $p < .01$; *** $p < .001$. 

From the diary analyses, the results and conclusions reported above remain virtually unchanged.
social comparison can modulate acute affective response and the development of PTSD symptoms. At the same time, our findings indicate that target direction (i.e. resilient versus vulnerable social comparison) rather than comparator similarity has a greater modulating effect on post-event processing. In the following, we first reconsider the findings on acute negative affect and then the effects on intrusive memories, before discussing potential implications.

Our finding that having a similar-resilient comparator attenuated acute negative affect compared to the similar-vulnerable comparison group partly aligns with and extends an experimental study by Takarangi et al. (2014), who found affective benefits of confronting participants with resilient social comparators after viewing a trauma film (i.e. testimonials that downplayed the emotionality; cf. Lepore et al., 2004, who used confederates to manipulate social feedback). Unlike expected, however, our manipulation of (sociodemographic) similarity did not seem to induce assimilation or contrast, as we predicted based on the selective accessibility model (Mussweiler, 2003). In particular, those comparing to a resilient professional paramedic did not have more negative comparative self-evaluations or higher levels of negative affect, than those who compared themselves to a resilient fellow student. Descriptively, those comparing to a resilient paramedic even displayed the strongest benefits in terms of negative affect attenuation across conditions. Taken together, our data suggest that the direction of comparison (i.e. upward vs. downward) played a more critical modulating role in the acute emotional response to the traumatic footage than the perceived similarity with the comparison standard on sociodemographic variables. In terms of a comparison process model (Morina, 2021), this could suggest that participants tended to valuate the outcome of upward comparison in an optimistic or self-affirmative way, whereas those comparing to a vulnerable standard valuated the comparison outcome in a more pessimistic or threatening way, thereby leading to differences in acute negative affect (see Figure 1). Notably, a more complex picture emerges when taking intrusion-related symptoms into account. Here, the group with a vulnerable comparator too reported significantly fewer intrusion symptoms than the control group. We found no differences between the similar-vulnerable and the similar-resilient groups, yet, the former had descriptively lower mean levels of most intrusion-related symptoms than the latter. This pattern of findings could indicate that comparison with a fellow student produced an assimilative outcome when the testimonial described a resilient reaction to the trauma films, and a more contrastive outcome when it described a highly negative reaction. Thus, the factors driving assimilation or contrast after social comparison may be different for upward and for downward comparisons. In terms of the comparison process, our results further suggest that participants in both of these conditions had optimistic or self-affirmative valuations, thereby reducing preoccupation with the traumatic films – even though the outcome of the comparison was opposite in direction (see Figure 1).

A surprising finding was that the effects of different-resilient and similar-vulnerable comparisons on acute affective responses appeared to be opposite to the effects on intrusion-related symptoms. This is remarkable because stronger acute increases in negative affect are among the most reliable antecedents of intrusive memories in the trauma film paradigm (e.g. Clark et al., 2015). Indeed, our post-hoc hierarchical regression analyses (Table 2) indicated that the similar-vulnerable group, and to some degree also the similar-resilient comparisons, attenuated the intimate link between acute negative and intrusive memories, relative to the no-comparison control group. Taken together, our data indicate that social comparison may have differential effects on acute affect and on the development of intrusions, which clearly merits further careful investigation.

In addition, the finding that comparison to a similar-vulnerable standard tended to reduce intrusion development seems partly at odds with the prior finding that self-defining features enhance assimilation to both upward and downward standards (J. D. Brown et al., 1992; Crusius & Mussweiler, 2012; McFarland et al., 2001; Mussweiler & Bodenhausen, 2002). One explanation might be that our manipulation of similarity was too weak for individuals confronted with an aversive film and the ensuing emotions. For instance, the characteristics signalling similarity in our study (i.e. sex, age and professional background) may have little informational utility regarding the ability to cope with a traumatic experience (Kruglanski & Mayseless, 1990). Future studies could attempt to increase the participants’ focus on (dis)similarities by means of priming tasks prior to the actual social comparison (e.g. having participants search for (dis)similarities among pairs of pictures; Mussweiler & Bodenhausen, 2002). Another potential explanation of our findings relates to the content of our testimonials. These described individuals with either entirely resilient reactions or strong negative emotions and disturbing intrusive memories. This framing might have cancelled out any potential impact of our manipulation of similarity, which would explain why both resilient and vulnerable comparison standards led to similar contrast levels. Further systematic investigation is clearly warranted to investigate these possible explanations, as these have the potential to push this area of research forward.

**Limitations**

This study has a few limitations that merit to be mentioned. First, by only manipulating the characteristics of the comparator, our study does not inform about motives and cognitive mechanisms mediating the effects of social
comparison on the affective outcomes. Future studies may want to directly address the roles of optimistic versus threatening valuations, cognitive change about the emotional materials, and/or self-efficacy. Second, some of our analyses indicate that explicit knowledge of the experimental manipulation may have attenuated the experimental effects. Although the influence of knowledge appears to be limited and could be controlled for, this may have led to a reduction in statistical power. Moreover, it might be worthwhile to include a more fine-grained measure of explicit knowledge. Third, we relied on the trauma film paradigm as a model of psychological trauma to address the development of analogue intrusions, implying that our results may not translate directly to traumatic samples. Finally, we did not include a separate different-vulnerable condition for economic reasons, implying that our results may not translate directly to traumatic experiences may be driven by different mechanisms that re-

**Conclusions**

To our knowledge, this study represents the first systematic attempt to chart the effects of upward and downward comparison with similar and dissimilar social standards on the psychological response to traumatic video footage. As such, our findings require thorough replication and extension and may serve to guide future studies in this field. It appears particularly promising to shed further light on the temporal dynamics of assimilation and contrast, given our findings indicating that the social comparisons may have had differential effects on acute negative affect on the one hand, and on intrusive memories on the other, overriding the tight association between the two responses to aversive experiences. Meanwhile, upward comparison with a dissimilar social standard may have benefits that are limited to acute affective responses to a stressor, while it may be irrelevant to the subsequent development of intrusions. Speculatively, this may be due to different mechanisms involved in acute affect regulation, as compared with the modification of consolidated emotional memories (Samide & Ritchey, 2020). Finally, our study indicates that assimilative and contrastive responses in upward and downward social comparisons following aversive experiences may be driven by different mechanisms that require further careful examination.

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**Data availability**

The datasets obtained and analysed for the current study are available in the Open Science Framework repository, using the following link: https://osf.io/g5pcq/.

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**Note**

1. When participants with some level of explicit knowledge were removed, the critical test statistics were as follows. H1: η(44) = 10.1, p < .001, d = 2.97; H2: t (46) = 0.7, p = .508, d = 0.19; Omnibus ANOVA group effect: F(2,69) = 65.53, p < .001, ηp2 = .655.

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