Bachelor thesis:

What causes the "sharp end" effect in the recall of disaster reports?

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Abstract

Past research has found that when individuals read disaster reports, they tend to recall the sharp ends, so the most immediate factors in time and space involved in the occurrence of the said disaster, rather than the blunt ends, which consist of the more distant, organisational causes. This sharp end effect in recall has been previously explored, but so far no conclusive explanation for what causes it has been found. In order to add to the discussion on why this effect may occur, this research replicated the majority of the methodology employed by Berkemeier (2021) with some modifications and manipulated the presence of explicit sharp end blaming in disaster stories. Forty-six participants were asked to read two distinct disaster stories, freely recall what they read and indicate to what degree they considered the different factors that were involved as responsible for causing the disaster. The results indicated that the presence of sharp end blaming did not affect either recall or blaming tendencies. However, a sharp end effect in recall was found, as well as a blunt end effect in how participants assigned blame. Both effects differed only minimally regardless of whether participants received disaster stories with or without sharp end blaming. These findings support the theory that the process of recall and the one of blaming occur as separate and distinct and can as a result exhibit very different effects, such as the sharp end effect in recall and the blunt end effect in assigning blame that appeared here.

Keywords: recall, disaster, sharp end, blunt end, sharp end effect, blunt end effect, blaming tendency

What causes the "sharp end" effect in the recall of disaster reports?

Whenever man-made disasters occur, people struggle to achieve a full awareness of the details involved and to keep track of the different factors that allowed them to take place. Largely, this can be attributed to the complexity presented by the many interconnected factors that enable their occurrence, as well as the generally incomplete reporting of any given disaster. Whether certain aspects remain unintentionally underreported, or deliberately omitted, such as in the name of sensationalism or clickbait journalism, it is rare to receive a full or objective accounting of the disaster in question (Geurts, 2013; Verschuur, 2013; Wurster, 2013; Kilgo, Harlow, García-Perdomo, & Salaverría, 2018; Bazaco, 2019). However, even aside from potential omissions or specific manipulations employed in the reporting, people appear to remember certain details of disaster reports more than others. Both Moning (2014) and Berkemeier (2021) have reported a *sharp end effect* in information recall in their respective studies on the recall of disaster reports. This sharp end effect in recall is defined as a tendency to recall the immediate factors influencing a disaster more than the more distant, organizational, and institutional causes, and past research has only observed and studied it in the context of the recall of disaster stories (Moning, 2014; Berkemeier, 2021). This research builds upon the previous findings of Moning (2014) and Berkemeier (2021) and in doing so, aims to further explore this phenomenon. Before their findings can be presented in detail, however, it is necessary to discuss some of the theories regarding accident causation, the assignment of blame, as well as the process of recall and how it can be influenced.

Relevant concepts and theory

The first topic that must be discussed is accident and disaster causation. Reason (1990a; 1990b; 2000) provided some of the more influential treatises about human error and the occurrence of man-made accidents. Reason noted that when investigating accidents there is a general tendency to blame sharp ends, the immediate factors that are closest in proximity to the event in question (Reason, 1990a; Reason, 1990b). This has been supported by several studies that found similar trends of focusing on the sharp ends during the investigation of accidents (Cook & Woods, 1994; Cedergren & Petersen, 2011; Dekker & Nyce, 2012). Reason (1990a) stated that only attending to what he labels active failures gives an incomplete view of the process involved in the creation of the accident. Rather, he believes it is important to look at the bigger picture and also consider the blunt ends, which are the more distant circumstances

surrounding disasters, rather than just the more immediate sharp ends (Reason, 1990a; Reason, 1990b). These blunt end causes in accidents are described by him as latent failures, which weaken the defences a system has in place to ensure that an accident is prevented (Reason, 1990a).

The relationship between the blunt and the sharp end is represented visually in the Swiss Cheese model of accident causation, in which the different levels that make up a given system are likened to slices of cheese, while the weaknesses in these different levels are represented as holes in the slices (Reason, 2000). As these systematic weaknesses in the levels overlap, they bring about the potential for enabling an accident in what Reason (2000) describes as "a trajectory of accident opportunity" (p. 769). It must be noted that the Swiss Cheese model of accident causation is not the only model that discusses how accidents come about, nor is it the most appropriate for all situations. More modern examples of accident causation models following this trend of considering both the sharp and the blunt include the AcciMap approach (Rasmussen, 1997), the Functional Resonance Analysis Method (FRAM) (Hollnagel & Goteman, 2004), or the Systems Theoretic Accident Model and Process (STAMP) (Leveson, 2004). Of these three, the STAMP model is most referenced in the professional analysis of accidents (Underwood & Waterson, 2012). It attempts to model the varying aspects of the system as a collection of different but interconnected processes aimed at continuously controlling the behaviour of the system to ensure its safety (Leveson, 2004). Much like the Swiss Cheese model, STAMP makes it a point to encourage users to consider both the sharp and blunt ends in the causation of accidents (Leveson, 2004).

This trend of differentiating between the most immediate and the more distant factors influencing the occurrence of accidents holds true in most of the other accident causation models as well e.g., multi-linear sequencing or the General Time Sequence model (Lehto & Salvendy, 1991; Woods, Dekker, Cook, Johannesen, & Sarter, 2010; Toft, Dell, Klockner, & Hutton, 2012). However, despite these different models actively encouraging users to not consider the sharp end as solely responsible for the occurrence of accidents, the fact remains that investigations of accidents are generally focused on human error (Cedergren & Petersen, 2011; Dekker & Nyce, 2012). A variety of potential explanations for this focus on the most immediate factors involved with disasters have been put forward, such as cultural perceptions in regard to accountability, or attempts to establish a hierarchy of blame that favours the blunt ends (Hollnagel, 2004; Dekker &

Nyce, 2012). Perhaps the simplest way to explain this phenomenon is that sharp ends are simply easier to comprehend for investigators than blunt ends (Hollnagel, 2002).

Another potential explanation for this tendency to focus on the short ends, rather than the blunt ends, may perhaps be found in how perceived blame can influence the perception and processing of information regarding disasters. In psychology, blaming falls under the study of attribution, which explores how people attempt to try to understand who or what is responsible for the occurrence of events (Kelley, 1967; Lagnado, 2008). It must be noted that attributions are rarely, if ever, objective. Rather, the process of attributing responsibility is subjective, as it incorporates a complex interplay of internal beliefs, past experiences, and perceived information (Menon, Morris, Chiu, & Hong, 1999; Malle, 2011; Shaver, 2016). Additionally, attributions of blame can be influenced externally, for example via the framing of events, or the act of scapegoating (Weaver, 1986; Nelson, Oxley, & Clawson, 1997; Douglas, 2002). As to the practical process of attributing blame, Alicke (2000) states in his culpable control model that individuals tend to blame spontaneously and impulsively, basing their judgements particularly on the degree to which the actor they judge was aware of the negative consequences of their actions. However, research has also shown that people will actively pay attention to information that appears relevant to their blame judgements, and revise their initial assumptions based on it (Monroe & Malle, 2019).

There are two distinct perspectives on what form this revision can take, both based upon moral philosophy. The motivated-blame perspective assumes that while individuals update their initial blame attributions, they are influenced by their prior judgements and seek to maintain them (Tetlock et al., 2007). As they encounter new information, they attempt to shape this information so that it adheres to their previously formulated assumptions on what factors are to blame (Greene, 2008; Uhlmann, Pizarro, Tannenbaum, & Ditto, 2009). An alternative to this idea of motivated blaming is the socially-regulated blame perspective, which describes the updating of blame attribution in a much different way. In the socially-regulated blame perspective, individuals are assumed to critically appraise new information and update their blame attribution accordingly (Monroe & Malle, 2019). Rather than seeking to preserve their initial judgements, they attempt to ascertain whether their moral judgements have appropriate evidence to be warranted. Consequently, blame judgements are updated in a more systematic and critical manner than in the motivated-blame perspective (Monroe & Malle, 2019).

As blame influences how details of disasters are perceived and processed, this initial perception of information may also affect its later recall, especially when considering the theory of reconstructive memory and the inherent malleability and fallibility of recall described therein. Bartlett (1920) was one of the early promoters of recall as a reconstructive process, after discovering how when presented with folk stories, subjects in his research would provide summaries that exhibited large contrasts from the tales they were initially exposed to. It was Bartlett's (1995) belief that memory was not stored as it was experienced, but rather reconstructed when prompted. Despite the novelty of his research, Bartlett's ideas about reconstructive memory would only get wider recognition after the publication of Loftus and Palmer's (1974) research into how specific language may alter memory. Specifically, they found what would become known as the misinformation effect, which is when individuals construct false memories after being exposed to misleading information (Loftus & Palmer, 1974). More than just this misinformation effect, however, Loftus and her co-workers demonstrated the susceptibility of recall for being distorted by a variety of factors and the ease with which this can occur, both during the encoding and storage of information, as well as the subsequent recall, in a wide-ranging series of studies (Loftus, 1975; Loftus, Miller, & Burns, 1978; Loftus & Palmer, 1996). Consequently, it is plausible that blame would be a factor influencing the eventual recall of details in disasters, affecting the retrieval of information in such a way that short ends are more likely to be recalled than blunt ends. Lending further credence to this idea, past research has shown that recall and blame are closely related to the point that an individual's blame judgements can alter their recall of details in stories (Pizarro, Laney, Morris, & Loftus, 2006).

Having introduced some of the most important concepts that form the basis of this research, the previous studies performed by Moning (2014) and Berkemeier (2021) can be presented.

Prior research into disaster recall

For her bachelor thesis, Moning (2014) explored the effect that story grammar in disaster stories can have upon the recall of individuals reading it. In order to test this, an experiment was performed that asked participants to memorize disaster stories either with or without story grammar. Moning found that there was a tendency to recall a greater number of sharp ends than blunt ends regardless of the presence or absence of story grammar. Furthermore, this effect occurred despite presenting participants in her research with texts that contained an unequal

number of sharp and blunt ends. This was the first recorded instance of the sharp end effect in the recall of disaster stories (Moning, 2014).

The sharp end effect in recall was further explored by Berkemeier (2021) in her master's thesis. She set out to study possible causes for the sharp end effect in the recall of disaster reports with a large-scale experiment. It was hypothesized that people remember disaster stories based on how blame is attributed to them. By manipulating the independent variables of the presence of sharp ends, and the presence of blunt end blaming, Berkemeier (2021) attempted to test this theory. Participants were asked to read a series of disaster stories and recall the details of these stories at later points in time. The initial measurements took place after filler tasks designed to erase working memory contents had been carried out, while the other measurements first occurred one week and then two weeks after. In the last meeting, participants were also asked to rate the degree to which they believed each sharp and blunt end to be responsible for the disaster. Berkemeier's (2021) results showed that the sharp end effect in recall remained regardless of the blaming of blunt ends present in stories, albeit it was less pronounced for participants that received texts with blunt end blaming. Furthermore, it was noted that whenever the stories included blunt end blaming, both sharp and blunt ends were recalled less than when there was no blunt end blaming present. Berkemeier argued that this may have been due to the presence of a recency effect, as the placement of blunt end blaming at the end of the stories caused participants to remember the blame statement, rather than the details of the sharp and blunt ends. This assumption was supported by previous research on recall of stories, which observed recency effects (Copeland, Radvansky, & Goodwin, 2009). Furthermore, she found that participants tended to place far greater blame on the blunt ends rather than the sharp ends regardless of manipulation, which she labelled a blunt end effect in assigning blame (Berkemeier, 2021). The inclusion of blunt end blaming in the disaster stories did appear to influence this effect, making it far more potent than when blunt end blaming was absent. However, despite this tendency to place blame upon the blunt end, sharp ends were blamed to a small degree anyway, even for participants that were presented with stories that did not include any sharp end factors. Here, Berkemeier believed that a potential confounding effect could have occurred due to the presentation of the responsibility questions in the third meeting. As they were all presented together, rather than separately, they may have evoked mutual comparison of blaming factors and thus influenced the way that the participants attributed blame. Based on her findings,

Berkemeier's overall conclusion was that recall and blaming may be considered separate cognitive processes (Berkemeier, 2021).

Current research

This research attempts to find what might cause the sharp end effect in the recall of disaster reports. So far, this effect has emerged within two different studies, which focused on manipulating vastly different variables. In the hopes of adding to the discourse on the cause of the sharp end effect, this research will also focus on manipulating a variable that has not previously been investigated. Namely, it will test whether manipulating the independent variable, *presence of sharp end blaming*, in disaster stories has an impact on the dependent variables, *average recall* of and the *average assigned blame* to sharp and blunt ends.

To produce results comparable to the previous experiments, this study replicates the methodology utilized by Berkemeier (2021) while making some important modifications. Precautions will be taken against two limitations that Berkemeier (2021) noted in her study. The first limitation is the potential influence of a recency effect, which Berkemeier (2021) noted may have impacted the recall tendencies of the participants in her research. While it is unclear whether this was the case, past research has shown that recency and primacy effects can affect recall in a variety of different topics, including the recall of story details from a novel (Crano, 1977; Copeland et al., 2009; Li, 2010). As such it was deemed prudent to minimize the risk of these effects influencing the research, by slightly shifting the order of the contents of the disaster stories. The second limitation noted by Berkemeier (2021) that will be addressed is the potential of a confounding effect occurring due to presenting the responsibility questions all at the same time. To prevent such an effect from occurring, responsibility questions were instead presented one at a time in this research.

Hypotheses

To propose a theory on how blame influences the recall of disasters and formulate hypotheses from said theory, it is necessary to summarize key points of the previously discussed concepts. To begin with, the literature regarding accident causation and blaming shows that sharp ends generally receive more attention and blame than blunt ends (Cook & Woods, 1994; Cedergren & Petersen, 2011; Dekker & Nyce, 2012). As such, it stands to reason that blaming sharp ends over blunt ends involved in disasters may be a commonly held blaming tendency

(Reason, 1990a; Reason, 1990b; Cook & Woods, 1994; Cedergren & Petersen, 2011; Dekker & Nyce, 2012). The concept that the blaming of sharp ends is a common blaming tendency is important in the context of disaster recall because previous research has established that attributions of blame can have an impact on how specific information is perceived and processed (Uhlmann et al., 2009; Greene, 2008; Monroe & Malle, 2019; Pizarro et al., 2006). Lastly, beyond just influencing perception and processing of disaster stories, the initial blame judgements may affect what specifically is reconstructed from memory when the recall is attempted (Bartlett, 1920; Loftus, 1975; Loftus et al., 1978; Loftus & Palmer, 1996). Together, this could imply that the tendency to blame sharp ends guides attention away from the blunt ends, resulting in the higher recall of sharp ends in disaster reports, as reported by Moning (2014) and Berkemeier (2021). Consequently, the introduction of sharp end blaming in texts should intensify the tendency to recall and blame sharp ends, while reducing the same for blunt ends, as it guides the reader's attention towards the sharp ends of disasters.

Under this assumption and in an attempt to answer the research question of 'What causes the "sharp end" effect in the recall of disaster reports?' the following hypotheses were put forward.

1. Sharp end recall will be higher for participants that read texts with sharp end blaming compared to participants that read texts without sharp end blaming.
2. Blunt end recall will be lower for participants that read texts with sharp end blaming compared to participants that read texts without sharp end blaming.
3. Assigned blame to the sharp ends will be higher for participants that read texts with sharp end blaming compared to participants that read texts without sharp end blaming.
4. Assigned blame to the blunt ends will be lower for participants that read texts with sharp end blaming compared to participants that read texts without sharp end blaming.
5. There will be a sharp end effect in recall regardless of whether participants read texts with or without sharp end blaming.
6. The sharp end effect in recall will be more pronounced for participants that read texts with sharp end blaming compared to participants that read texts without sharp end blaming.

Method

Participants

In total, forty-nine individuals participated in the experiment, however the data of three individuals had to be excluded from the analysis. Recruitment of participants occurred via the Test Subject Pool SONA, hosted by the University of Twente, and personally asking for participants over available communication channels. To qualify for participation, a good internet connection, as well as a webcam and microphone, were required. Furthermore, potential participants had to be students at a university, as well as possess sufficient skills in the English language.

Other criteria for taking part in the research were that the participants were unaware of the details of the disaster stories that they would have to read prior to this research. Consequently, if it appeared that they held information of the disasters other than what was listed in the disaster stories, their data was considered unusable. The data collected from one participant had to be eliminated for this reason.

Furthermore, the data of two more participants had to be deleted, due to being identified as outliers in several categories, sporting both low recall values and assigning blame radically different from the norm.

Of the remaining forty-six participants, 20 (43.5%) were male, and 26 (56.5%) were female. The ages of the participants ranged from 18 to 30, with a mean of 21.7 (SD = 2.1). Furthermore, 35 (76.1%) participants were German, 7 (15.2%) were Dutch, and 4 (8.7%) participants listed a different nationality. All participants were students at the time of the research, currently attending, or having at some point attended, a programme taught in English. Of the forty-six participants 23 (50%) participants were assigned to the sharp end blaming present condition and 23 (50%) participants were assigned to the sharp end blaming absent condition. The experiment was approved by the BMS Ethics Committee of the University of Twente.

Materials

The materials used in this research were primarily based upon the ones used in Berkemeier's (2021) research on disaster recall, and as such were either identical or very similar to the ones used there. She conducted her study by presenting participants with stories she wrote based on a variety of disasters that were covered by both scientific and non-scientific sources.

These stories included both actual and fabricated information, to make sure there were four explicit sharp and blunt ends present. Additionally, each story had different versions, depending on which independent variables were being manipulated (Berkemeier, 2021).

In the current study only the versions of the stories describing the ICE disaster nearby Hannover and the Kiss nightclub disaster with and without blunt end blaming statements were utilized. The texts that included blunt end blaming were altered to instead blame the sharp ends and the position of the blame statements was changed from the end of the text to the middle, to avoid any potential recency effects from occurring (see Appendix C). The modifications made to enable the blaming of sharp end factors were not in any way backed up by factual sources, rather, it was deemed more important that the blame statements closely imitate the style of the original blunt end blaming. As such, blame statements consisted of two sentences. The first referenced how specific sharp ends named previously were charged for manslaughter, while the second denoted a reason for this charge. For example, the blaming statement of the ICE disaster nearby Hanover was phrased as such, “Both the train manager and train conductor were later charged with manslaughter. Had they acted earlier, more deaths could have been prevented”.

In the face of these necessary changes, it was ensured that the length of the different story versions only differed by a single sentence and at most four words. Using an algorithm that allowed the calculation of the Flesch reading ease score for a text (http://www.readabilityofwikipedia.com), the readability of each text was measured. Scores ranged from 58 to 66, with a maximum four-point difference between versions with and without blaming, showing that the texts were fairly readable.

Coding schemes

Similarly to the process adopted to modify the stories, the coding of information and the coding schemes were primarily based upon the ones constructed by Berkemeier (2021) for her research. Each version of the disaster stories used its own specific coding scheme, modified to account for the altered methodology, as well as the differences in story content as a result of the manipulations (see Appendix I). However, the categorization of information was similar across versions within the same condition. Namely, in the condition “Sharp end blaming present” there were four different categories of information, titled contextual information, sharp ends, blunt ends, and concrete sharp end blaming. Meanwhile, the condition “sharp end blaming absent” only

had contextual information, sharp ends, and blunt ends, as there was no explicit and concrete blaming in the stories.

Design

This research employed a between-subjects design. The independent variable that was manipulated in this experiment was the presence of sharp end blaming. As such, there were two conditions, "sharp end blaming present" and "sharp end blaming absent". In the "sharp end blaming present" condition participants read two disaster stories that contained explicit, fabricated blaming of the most immediate factors involved in causing the disaster, while participants in the "sharp end blaming absent" condition received the same stories without blaming.

Two dependent variables were measured. Participants' recall of the disaster stories was measured with free recall tasks (see Appendix E), similar to prior research by Moning (2014) and Berkemeier (2021), and consisted of the elements, "recall of sharp ends" and "recall of blunt ends". These values were recorded as the number of relevant details recalled, divided by the total number of details recalled, resulting in a comparable average. The blaming tendency of participants was measured with a series of responsibility questions (see Appendix F), largely similar to the ones used by Berkemeier (2021), with one question for each of the ends named in the disaster stories and consisted of the elements "assigned blame to sharp ends" and "assigned blame to blunt ends". The responsibility questions were presented one at a time and employed a 5-point Likert scale with options from "not at all responsible" to "extremely responsible", with an additional "not applicable" option, depicted in a red font and italicized. The participants' answers to these questions were summed for the sharp ends and blunt ends and then averaged, to facilitate better analysis.

Procedure

The experiment was conducted entirely online, due to COVID-19 restrictions in force at the time of the experiment. Using Google Meets, a one-on-one meeting with the researcher and the participant was held at a scheduled time. In the meeting, participants were asked to share their video, audio, and screen for the duration of the experiment.

Once the participant did so, they received a link to a survey produced with Qualtrics. This survey contained all directions the participant needed to follow, as well as all the tasks they were

asked to perform. While the survey provided almost all necessary instructions by itself, the participant was informed that they could ask the researcher any questions they might have.

In the survey, participants were first asked for their informed consent (see Appendix A). Next, they received four questions that aimed to establish whether they held prior information about the disasters they would be asked to remember. This was followed by two questions to determine their level of English proficiency (see Appendix B).

By using Qualtrics, the participant was randomly assigned to either the "sharp end blaming present" or the "sharp end blaming absent" condition. Once assigned to a condition, they were randomly presented with one of the two disaster stories. Participants had five minutes to read through the story twice. There was a visible timer counting down, and once the five minutes had passed, the page automatically advanced to a calculation task, which was placed there to disrupt any potential rehearsal behaviour by participants. The participant could also advance the page manually if they were finished reading earlier. At this point, the participant was asked to perform a continuous verbal calculation task for two minutes, which consisted of either counting back by sevens from the number 794 or by nines from the number 828, depending on which disaster story they read before the calculation task (see Appendix D). The researcher would notify the participant once the two minutes were over. When completed, the participants were allowed to advance to the next task, which asked them to write down everything they remembered of the story they read. There was no time limit for this task. This process was then repeated for the other disaster story.

Afterwards, the participants were asked whether they recognized any of the stories after reading them, and if so, specify which.

In the next section of the survey, participants were presented with two sets of responsibility questions, one for each story. Participants were asked to indicate to which degree they believed certain factors in stories were responsible for the disaster. The responsibility questions that the participant received were also formulated slightly differently, based upon which condition they were assigned to. This was done mainly to present the factors as they were mentioned in the stories and avoid potential confusion in the participant. Using Qualtrics, it was ensured that the order in which the participant received the sets was random. Furthermore, so that the order in which the responsibility questions were presented did not influence how the participant answered them, they were also randomized within their set.

The last section of the survey asked the participant to provide demographic information such as gender, age, nationality, level of education and working field. Once this had been filled out, the survey was completed. At this point the participant was debriefed by the researcher, receiving an oral explanation of the background of the research, as well as what specific manipulations were utilized in the experiment. The participant was asked to clarify one last time whether they were willing to have their data used, now that they were aware of the purpose and process of the experiment (see Appendix H). After the participant indicated their answer, they were thanked for their participation and sent off. Participants took on average 35 (SD = 5.78) minutes to complete the experiment.

Data Analysis

Once the data was collected, it was analysed using the IBM Statistical Package for Social Sciences (SPSS) Version 26, with a 0.05 significance level. The dependent variables that were analysed were the average sharp end recall and average blunt end recall, as well as the average assigned blame to the sharp ends and the average assigned blame to the blunt ends. Additionally, the average recall of all elements for each story was investigated, to determine whether there was a large difference in participants' recall of elements between the stories.

The data was explored with descriptive statistics, to determine whether the skewness and kurtosis values and the Shapiro-Wilk test implied normality, as well as to identify potentially notable outliers. Outliers were only eliminated from the data analysis if they differed more than four standard deviations from the mean in at least one dependent variable, and their removal would change the data to a significant degree.

If it was established that a relevant dependent variable was normally distributed, the means between the groups of the two conditions were compared using an independent measures t-test. Alternatively, if it was found that the dependent variable was not normally distributed, it was analysed using a Mann-Whitney U test instead. Furthermore, if it could be confirmed that the relevant data was normally distributed, a paired samples t-test was employed to investigate whether there was a significant difference within each condition between sharp and blunt end recall and assigned sharp and blunt end blame. Should the data not possess a normal distribution, a paired samples Wilcoxon test was used instead.

Results

Checking for normality

When investigating the data for both conditions of sharp end and blunt end recall, as well as assigned blame to the sharp and the blunt ends, it was found that they were slightly skewed and kurtotic, although not to the degree that it would differ from a normal distribution. However, when using the Shapiro-Wilk test for normality, it was found that the recall of sharp ends was below the significance value of 0.05 for both conditions ($p_{BlamingPresent}$ = .029, $p_{BlamingAbsent}$ = .014). As such the data for this dependent variable was not treated as normally distributed, and any analysis involving these variables used nonparametric statistical tests.

Overall recall between disaster stories

To discover whether there was a notable difference between the overall recall of stories, the recall of all elements per disaster story for both conditions was averaged and compared. The averages were very similar, with an average of 64.8% (SD=21.1) recalled for the ICE disaster nearby Hanover and 66.3% (SD=17.5) for the Kiss nightclub disaster. A paired samples t-test further confirmed that there appeared no significant difference between the recall of both disaster stories, $t(45) = -0.55$, $p = .586$. Due to this, it was deemed acceptable to treat the stories as duplications, and compare the gathered data of both stories together, rather than separately for each story.

Table 1

Medians (number of cases) and means (standard deviation) for average recall per condition

		Sharp end recall	Blunt end recall
		Mdn (*n*)	*M* (*SD*)
Sharp end blaming	Present	.75 (23)	.55 (.25)
	Absent	.88 (23)	.58 (.22)

Average recall between conditions

As the average recall of sharp ends was not normally distributed for either condition, it was necessary to use a Mann-Whitney U test in order to compare them. It showed that the average recall of the sharp ends did not differ significantly for the group that received disaster

stories with sharp end blaming (*Mdn* = 0.75, *n* = 23) compared to the group that received texts without sharp end blaming (*Mdn* = 0.88, *n* = 23), *U* = 231.00, *z* = -.76, *p* = .227, with a small effect size *r* = 0.11, see Table 1. Based on these results, hypothesis one is rejected.

Since the average recall of blunt ends was approximately normally distributed, it was possible to instead use an independent samples t-test to compare their means. It was found that the average recall of the blunt ends did not differ significantly for the group that received disaster stories with sharp end blaming (*M* = 0.55, *SD* = 0.25, *n* = 23) compared to the group that received texts without sharp end blaming (*M* = 0.58, *SD* = 0.22, *n* = 23), *t*(44) = -0.47, *p* = 0.321, see Table 1. Based on these results, hypothesis two is rejected.

Table 2

Means and standard deviations for average assigned blame per condition

		Average Assigned Blame	
		Sharp ends	Blunt ends
		M (*SD*)	*M* (*SD*)
Sharp end blaming	Present	3.14 (.41)	4.20 (.27)
	Absent	2.98 (.52)	4.01 (.50)

Average assigned blame between conditions

As the assigned blame to the sharp and blunt ends was approximately normally distributed for both conditions, an independent samples t-test was used to compare their means between conditions, see Table 2.

It was found that the average assigned blame to the sharp ends did not differ significantly for the group that received disaster stories with sharp end blaming (*M* = 3.14, *SD* = 0.41, *n* = 23) compared to the group that received texts without sharp end blaming (*M* = 2.98, *SD* = 0.52, *n* = 23), *t*(44) = 1.162, *p* = 0.126. Based on these results, hypothesis three is rejected. Similarly, the average assigned blame to the blunt ends did not differ significantly for the group that received disaster stories with sharp end blaming (*M* = 4.20, *SD* = 0.27, *n* = 23) compared to the group that received texts without sharp end blaming (*M* = 4.01, *SD* = 0.50, *n* = 23), *t*(33.931) = 1.550, *p* = 0.065. Based on these results, hypothesis four is rejected.

Table 3

Medians and number of cases for average recall per condition

		Average recall	
		Sharp ends	Blunt ends
		Mdn (*n*)	*Mdn* (*n*)
Sharp end blaming	Present	.75 (23)	.63 (23)
	Absent	.88 (23)	.63 (23)

Average recall within conditions

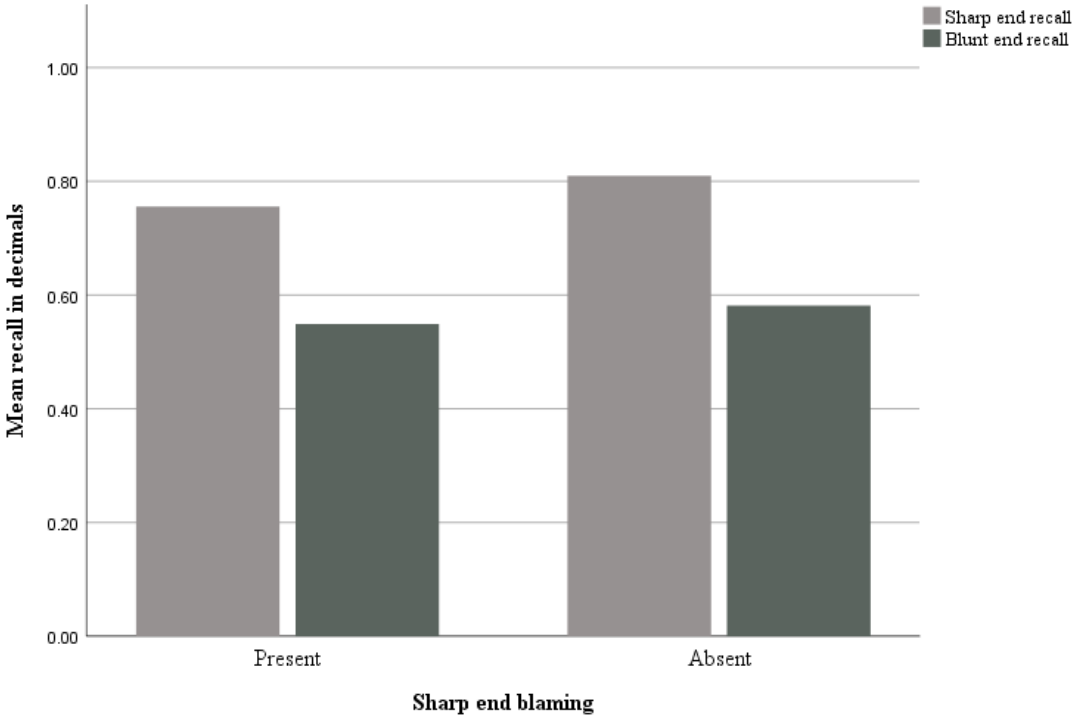
Due to the lack of normal distributions for the recall of sharp ends in both conditions, a paired samples Wilcoxon test was used in order to compare the average recall of sharp ends to the average recall of blunt ends within each condition, as seen in Table 3.

It was found that there was a significant difference for the average sharp end recall (*Mdn* = 0.75, *n* = 23) compared to the average blunt end recall (*Mdn* = 0.63, *n* = 23) in the group that received texts with sharp end blaming, $z = -3.79$, $p < .001$, with a large effect size r = 0.56. Furthermore, there was also a significant difference for the average sharp end recall (*Mdn* = 0.88, *n* = 23) compared to the average blunt end recall (*Mdn* = 0.63, *n* = 23) in the group that received texts without sharp end blaming, $z = -3.58$, $p < .001$, with a large effect size $r = 0.53$.

Consequently, as can be seen in Figure 1, there is a sharp end effect in recall for both conditions, meaning hypothesis five is accepted. However, due to the similarity in effects hypothesis six is rejected.

Figure 1

Comparison between sharp end recall and blunt end recall per sharp end blaming condition



Exploratory analysis: Average assigned blame within conditions

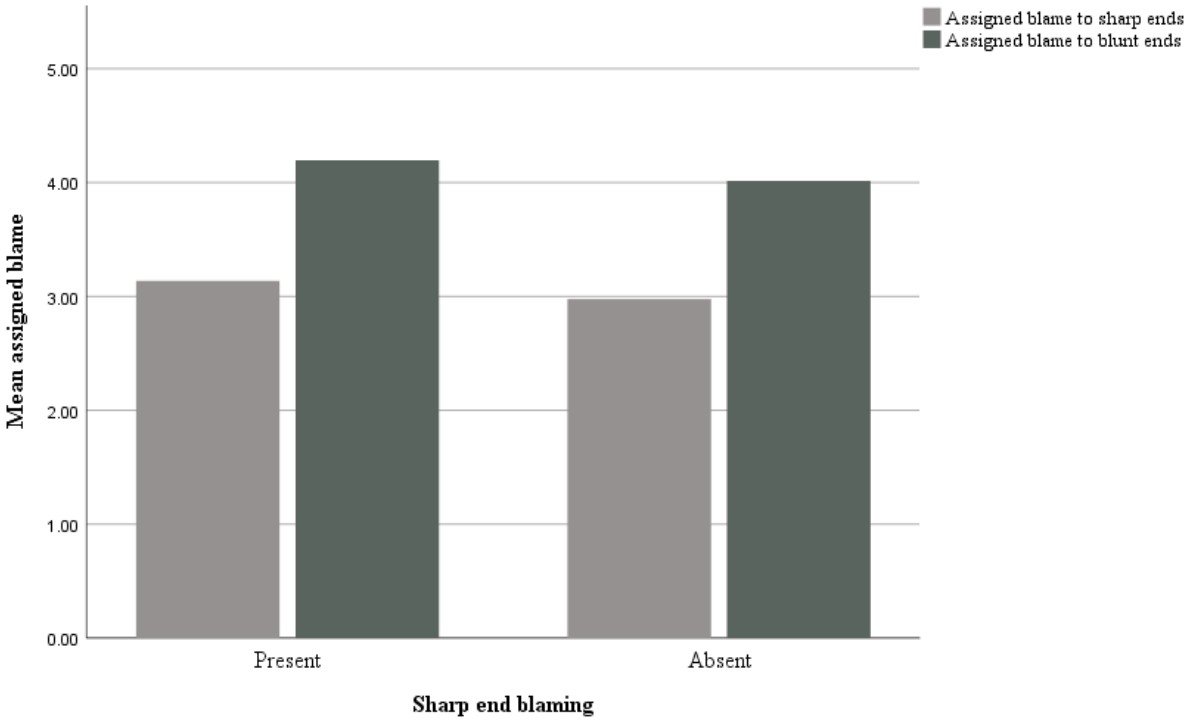
As all dependent variables required to analyse the average assigned blame within conditions were approximately normally distributed, a paired samples t-test was performed, to compare the means as depicted in Table 2.

A significant difference was found for the average assigned blame to the sharp ends (M = 3.14, SD = 0.41) compared to the average assigned blame to the blunt ends (M = 4.20, SD = 0.27) in the group that received texts with sharp end blaming, $t(22) = -10.72$, $p < .001$, with a large effect size $d = 2.23$. Similarly, a significant difference was found for the average assigned blame to sharp ends (M = 2.97, SD = 0.52) compared to the average assigned blame to the blunt ends (M = 4.01, SD = 0.50) in the group that received texts without sharp end blaming, $t(22) = -9.56$, $p < .001$, with a large effect size $d = 1.99$.

Consequently, as can be seen in Figure 2, there is a blunt end effect in assigning blame for both conditions. This blunt end effect is very similar between conditions.

Figure 2

Comparison between assigned blame to the sharp ends and assigned blame to the blunt ends per sharp end blaming condition



Discussion

This research attempted to answer the research questions 'What causes the "sharp end" effect in the recall of disaster reports?'. In order to accomplish this, it borrowed heavily from the methodology utilized by Berkemeier (2021), while making several important changes. Specifically, it was investigated whether manipulating the presence of sharp end blaming in disaster stories would influence the recall of and the blame assigned to sharp and blunt ends. This investigation found no noticeable difference in either recall or blaming, regardless of whether sharp end blaming was present or absent in disaster stories. Furthermore, evidence was found that the effects previously noted by Berkemeier (2021) when manipulating the presence of blunt end blaming in disaster stories may have been due to her methodology creating recency and confounding effects. This could imply that the presence of explicit blaming in a text simply does not affect the recall or blame judgements of individuals. However, despite this being the case, it must be noted that a sharp end effect in recall persists, much as it was found in both Moning's (2014) and Berkemeier's (2021) research. Additionally, a blunt end effect in assigning blame was

identified, very similar to the one found previously (Berkemeier, 2021). This lends further support to Berkemeier's (2021) theory that recall and blaming occur as separate processes, and as such can exhibit radically different effects.

Neither sharp end nor blunt end recall differed noticeably between participants that received texts with sharp end blaming and those who received texts without. This is very different when compared to Berkemeier's (2021) research, as she found a recognisable difference in both sharp end and blunt end recall when she manipulated the presence of blunt end blaming in her texts (Berkemeier, 2021). The best explanation for this is in line with her reasoning that the specific differences in recall between conditions she observed may have occurred due to her placement of the blunt end blame statements at the end of her text, resulting in a recency effect. In other words, individuals that received texts with said statements tended to remember them rather than the sharp and blunt ends contained in the text (Berkemeier, 2021). This is confirmed by prior research demonstrating a recency effect in text recall (Crano, 1977; Copeland et al, 2009; Li, 2010). The findings of this research further support this idea. In the present study, in an attempt to reduce the potential of a recency effect occurring, the sharp end blame statements were placed in the middle of the text. Assuming this modification functionally eliminated a recency effect, participants may in turn have been unaffected by the difference in context presented by the presence of sharp end blame statements, resulting in the overall similar recall of sharp and blunt ends found across conditions.

A similar lack of recognisable difference was identified for the blame assigned to sharp and blunt ends, regardless of whether participants received texts with or without sharp end blaming. Again, the chosen methodology may be responsible. As Berkemeier (2021) previously noted the potential of a confounding effect when presenting the responsibility questions all at once, in this research they were presented one at a time and in a randomized order. This may have ensured that participants were unable to compare the different responsibility questions to one another and instead to consider how to assign blame for each end individually.

While no noticeable difference could be determined for either sharp end or blunt end recall and blaming between conditions, it was found that participants on average recalled far more sharp ends than blunt ends and assigned far more blame to blunt ends than sharp ends. Furthermore, the sharp end effect in recall and blunt end effect in assigning blame was identified in both conditions and only minimally more pronounced for the group of participants that received texts with sharp end blaming. These findings are in line with the ones found by both

Moning (2014) and Berkemeier (2021), albeit for the latter the difference in the effects was far more pronounced between conditions.

These findings could be explained by the theory that recalls and blaming are different processes, which Berkemeier (2021) proposed after observing both a sharp end effect in recall and a blunt end effect in assigning blame in her research. To support her theory, she referred to the dual-process theory, which describes cognition as consisting of two distinct systems that can be active at the same time (Kahneman, Gilovich, & Griffin, 2002; Kahneman, 2003; Berkemeier, 2021). Of the two, system 1 is automatic and unconscious, while system 2 allows for more conscious control of its processes (Kahneman et al., 2002; Kahneman, 2003). She posited that recall may occur in system 2, as it requires actively reconstructing the memory of what was read, while blaming is inherent to system 1, occurring automatically and without much conscious control (Berkemeier, 2021). This may also have been the case in the current study.

In an effort to reproduce a coherent story in the free recall task, the participants employed system 2, actively and purposefully selecting the information they could retrieve from memory to produce a probable chain of events that led to the disaster. In the process of performing this reconstruction and attempting to keep it coherent, participants may have simplified the complexity of disasters, a tendency which has previously been noted in both scientific and non-scientific literature (Geurts, 2013; Verschuur, 2013; Wurster, 2013; Feltovich, Hoffman, Woods, & Roesler, 2004). The somewhat nebulous and less clearly defined blunt ends were neglected, whereas the more salient sharp ends that were directly pertinent to the series of events that participants were labouring to reconstruct were prioritized (Hollnagel, 2002). This then resulted in a sharp end effect in recall that was discovered by Moning (2014) and Berkemeier (2021) and further supported by this research.

Meanwhile, the assignment of blame is supposed to have occurred in system 1, unconsciously and immediately when participants first read the texts they received. Once they were confronted with the responsibility questions, they merely had to retrieve these initially formulated blame statements and indicate an answer based on them. In contrast to the free recall this would not require any effortful reconstruction of memory from relevant information in system 2, as the questions themselves may have served as sufficient prompts for recognition (Shepard, 1967). Furthermore, the lack of a difference in effect between conditions implies that people take and retain a specific blaming stance, regardless of the presence of sharp end blaming. This would support the blaming tendencies established by the motivated-blame perspective, in

that people make an overarching blame judgement and then process information based on whether it is compatible with this judgement (Greene, 2008; Uhlmann et al., 2009). Consequently, sharp end blaming had no effect on the assigned blame, as the initial blame statement is resistant to change from information that goes against it (Tetlock et al., 2007). As to why more blame was assigned to the blunt ends than the sharp ends, Bucher (1957) has previously theorized that individuals will attempt to blame the factor or factors that they subjectively consider as the logical origin for the events that transpired in a disaster. Participants in this research may have similarly considered the listed blunt ends as the logical cause, whereas the sharp ends were merely factors involved involuntarily in the chain of events that transpired in the disaster. In such a way a blunt end effect in assigned blame occurred, similar to the one recorded by Berkemeier (2021).

Limitations

The most notable limitation of this research lies in the fact that multiple changes have been made to the methodology employed by Berkemeier (2021). While these changes were initially made based on concerns noted by her, as well as to provide clearer results, they now serve to somewhat obfuscate which specific change resulted in the present findings. The only thing that can clearly be confirmed at this time is that there is a sharp end effect in recall and a blunt end effect in assigning blame. It could be that the introduction of sharp end blaming had no impact on recall and blaming tendencies. Alternatively, the changes in methodology may have simply resulted in the absence of a recency effect influencing recall and a confounding effect influencing blaming tendency. Any conclusion drawn from this research must consider that it may be the change in methodology that generated these specific findings, rather than the manipulation of the presence of sharp end blaming within a disaster story.

Another potential limitation that must be considered lies in the sample of participants. Berkemeier (2021) previously theorised that the blunt end effect in assigning blame that she found may be due to the critical thinking skills of her sample, as it primarily consisted of current or former university students. As this research draws upon a very similar sample, the possibility remains that the blaming tendencies exhibited by the participants were due to their level of education. Previous training in critical thinking skills may have afforded the participants resistance to the attempted manipulation of sharp end blaming presence. Such a resistance would

certainly explain why no notable differences were found in how blame was assigned regardless of condition.

Lastly, the construction of the sharp end blame statements could potentially be a limitation. As previously noted, the attribution of responsibility takes two forms, specifically moral responsibility, or causal responsibility (Kelley, 1967; Lagnado, 2008). Participants may have assumed that the sharp end blame statements implied a causal responsibility of the sharp ends for the occurrence of the disaster, rather than a moral one. In other words, the actions of the sharp ends were seen as having led to the disaster, but not as morally wrong. As a result, the sharp end blame statements were not processed according to either the motivated-blame or socially-regulated blaming perspective, as those assume that only the attribution of moral responsibility influences the processing of information. Furthermore, as already mentioned by Berkemeier (2021), participants may have been unclear on whether to assign moral or causal responsibility to the sharp and blunt ends, which could have impacted the findings.

Future Research

Future research into the recall of disaster stories has several potential avenues it could explore. The most immediate of those would be ones involving further research of the potential impacts of sharp and blunt end blaming statements on recall and the assignment of blame. It could be further investigated whether the presence of blaming truly has no impact on the recall and assignment of blame towards sharp and blunt ends. However, if this is being considered, the previous limitations should be kept in mind. Any research that replicates this methodology may need to question the validity of its findings. As such, rather than direct replications, it might be more useful to systematically investigate whether any of the limitations listed by Berkemeier (2021) and this research can be eliminated. Determining what specifically caused the difference in findings between Berkemeier's (2021) and this research may yield more insight into what can effectively influence both recall and blaming tendencies.

However, rather than investigating limitations, it may be more interesting to assume that the results of the studies by Moning (2014), Berkemeier (2021) and this research do in fact stem from the respectively manipulated independent variables. If this is the case, then one can exclude both story order and sharp end blaming as factors responsible for the sharp end effect in recall. This leaves the manipulation of blunt ends in some way as the most viable next step to determine what causes the sharp end effect in recall for disaster reports. For example, it could be

investigated whether the removal of blunt ends in a text will result in overall higher recall of sharp ends and more blame being assigned to them.

Alternatively, a more practical line of research could be exploring whether certain sharp and blunt ends are recalled more frequently than others. It is possible that there is a certain quality to specific sharp and blunt ends that makes them easier to recall. Such research may shed light on how to practically formulate sharp and blunt ends in a way that their recall is more balanced and allow for the consequent avoidance of the sharp end effect that has been so consistent throughout various research.

Equally practical, future research could investigate recall and blaming tendencies for different disasters than the ones used in this and Berkemeier's (2021) study. Perhaps there is some universal aspects in disaster stories that lead to this occurrence of the sharp end effect in recall and blunt end effect in assigning blame, something that with enough experimentation and manipulation of variables may be isolated and identified.

However, should any future research intend to use blame statements in disaster stories, it should ensure that it consistently uses the right type of attribution in the construction of its methodology. Implying a causal fault in the disaster stories, and later presenting responsibility questions that appear to ask for attributions of moral fault by the participant may impact the quality of recorded data. Alternatively, it could be specifically investigated whether statements that attribute causal or moral responsibility generate different trends in how sharp and blunt ends are recalled and blamed later. This could potentially lead to findings that help answer the question what causes the effects found in this and past research on disaster recall.

Furthermore, in the event that future research employs Likert-scale responsibility questions to determine blaming tendencies, it should ensure that the order of these questions is randomized, and that they are only presented one at a time. In such a way a confounding effect where participants compare the questions to one another may potentially be avoided.

Practical implications

As has been similarly stated by Berkemeier (2021), the results of this investigation suggest that if, in the construction of disaster stories, it is necessary to place blame statements, they should be located towards the middle of the text, rather than the end, to avoid a recency effect. Furthermore, the findings of this research support her notion that recall and assigning blame occur as separate processes, while it was also found that explicit blaming of sharp ends

may influence neither, at least within the context of disasters (Berkemeier, 2021). As such, statements implying such sharp end blame would best be avoided altogether in disaster reports, and instead the focus should be on providing the reader with a cohesive series of events that detail how a given disaster took place.

Conclusion

To conclude this research, further evidence for the presence of a sharp end effect in the recall of disaster stories, first reported by Moning (2014) and later by Berkemeier (2021) has been found. Additionally, a blunt end effect in assigning blame was found, similar to the one reported by Berkemeier (2021). However, the presence of sharp end blaming did not appear to have any impact on either recall or blaming of sharp and blunt ends. Furthermore, blunt end blaming may be similarly ineffective in influencing recall and blaming tendencies, considering that the findings of this research imply that recency and confounding effects could have occurred in Berkemeier's (2021) study. As such, the most concrete answer this research can give for the research question 'What causes the "sharp end" effect in the recall of disaster reports?' is that it does not appear as though the presence of explicit blaming is responsible.

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Appendices

Appendix A: Informed Consent

Welcome to this experiment!

This experiment should take at most 60 minutes and will ask you to perform several tasks. You will first read a report about a certain disaster, followed by a brief verbal calculation task, and finally write down whatever you can remember of the stories you have read. After you have completed this process for two stories, you will be asked some questions about them. There are no correct or incorrect answers for any of the tasks or questions, so please answer as you feel is best.

Participating in this experiment is entirely voluntary, and you have the right to withdraw from it at any time. All data collected over the course of this experiment will be treated as confidential, and made anonymous, so it cannot be used to identify you in the case any part of this research is publicized. In the case you have questions at any point during the experiment, please feel free to ask them.

In the case of any questions regarding this research, please contact Tobias Merkelbach, via t.m.merkelbach@student.utwente.nl.

In the case of concerns or complaints with the research, please contact the Faculty of Behavioural, Management and Social Sciences at the University of Twente, via ethicscommittee-bms@utwente.nl.

By consenting to participate, you acknowledge that you are voluntarily taking part in this experiment, are aware you can withdraw consent and end your participation whenever you want, and that you are at least 18 years old.

- o Yes, I consent
- o No, I do not consent

Appendix B: Questions for Inclusion/Exclusion of Participants

In the following, a few general questions about your knowledge of the different disasters/accidents will be asked. If you do not know the answer to the questions, please indicate so. If you have a vague idea about the disaster/accident, please write it down as well.

ICE Disaster nearby Hanover

What happened during the ICE Disaster nearby Hanover?

_____

Do you have any additional information about the ICE Disaster nearby Hanover?

- ○ Yes, _____
- ○ No

Kiss Nightclub Disaster

What happened during the Kiss Nightclub Disaster?

_____

Do you have any additional information about the Kiss Nightclub Disaster?

- ○ Yes, _____
- ○ No

How do you rate your ability to read short English texts or stories?

Very Bad						Very Good
○	○	○	○	○	○	○

Were/are you part of a study program that was/is taught in English at a university or university of applied sciences?

- ○ Yes
- ○ Yes, but temporary
- ○ No

Appendix C: Disaster Stories

CONDITION 1: SHARP END BLAMING PRESENT

Sharp ends

Blunt ends

Contextual information

Concrete blaming

ICE Disaster (Blaming Present)

4 Blunt Ends, 4 Sharp Ends; Concrete Sharp End Blaming [300 words]

In 1998, hundreds of people had been traveling onboard the ICE of Deutsche Bahn*. Shortly after the stop in Hanover, the tire of a wheel broke at a high speed and punctured the floor. The train conductor noticed some vibrations but mistakenly did not consider them severe. Two passengers from the first wagon noticed that a piece of the cracked wheel came up through the floor. One of the two passengers was completely in shock and unresponsive while the other one went to report the damage to the train crew. According to the Deutsche Bahn policies, an emergency stop was only allowed after visual inspection by the reluctant train manager. Precious time elapsed by insisting on investigating the very noticeable damage before stopping the train. In the meantime, the broken wheel rim slammed against the guard rail of the next switch point. The switch point was close to an overpass bridge, pulling it away from the railway track. Shortly after, the back part of the train was being slammed against the road bridge. The bridge collapsed, burying parts of the train underneath it. Over one hundred people died or were injured, some critically. Both the train manager and train conductor were later charged with manslaughter. Had they acted earlier, more deaths could have been prevented. The failure was traced back to the design and testing of Deutsche Bahn because the wheel design decisions were only based on analysis and theory. Additionally, Deutsche Bahn did not replace the wheels on time, even though they were being worn below the recommended standard in diameter. Furthermore, the emergency operation procedures of Deutsche Bahn contributed to the disaster as well. Lastly, the placement of the switch, an inherent hazard for high-speed trains, at the overpass bridge, contributed to the severity of the disaster.

*Deutsche Bahn is a German railway company.

Flesch Reading Ease Score: 62

18 sentences

Kiss Nightclub Disaster (Blaming Present)

4 Blunt Ends, 4 Sharp Ends; Concrete Sharp End Blaming [326 words]

In 2013, a major fire occurred at the Kiss nightclub in the city of Santa Maria, Southern Brazil. Against the club's capacity, it was packed with at least one thousand people. The security guards thoughtlessly let all people in who already paid for their ticket ahead. The fire started during the night. A band performing at the club irresponsibly let off fireworks meant for outdoor use. They did not buy the more expensive indoor fireworks. It resulted in the cheap material of the club's ceiling getting ignited. Due to a malfunctioning fire extinguisher, the blaze spread throughout the packed club at lightning speed. Thick, toxic smoke got emitted. Those inside panicked as they tried to get out, but the security guards foolishly did not let them out. The security guards could not directly evaluate the situation's severity inside. According to the club's regulation, they only let people out who paid for their drinks. The toxic smoke made the barkeeper and audience lose their sense of direction. The barkeeper started pointing people towards the emergency exit. However, the people apparently confused the bathroom doors with the exit door. The band and the club staff were later charged with manslaughter. The band was judged as being the main cause for the fire, and the staff actively prevented people from reaching safety. The club had inflammable insulating foam material in the ceiling and faulty fire safety equipment. It had neither an alarm nor a sprinkler system. Furthermore, the club had only one emergency exit. Moreover, metal barriers used to keep people in line on their way inside were placed. They ended up blocking people from getting out. Once the security guards realized how serious the fire was, they tried to help people escape. Additionally, firefighters had to open a hole in the outer wall to allow more people to escape. Hundreds of youngsters were killed or hospitalized for smoke inhalation and burns. Dozens of them were in critical condition.

Flesch Reading Ease Score: 58

26 sentences

CONDITION 2: SHARP END BLAMING ABSENT

Sharp ends

Blunt ends

Contextual information

ICE Disaster (Blaming Absent)

4 Blunt Ends, 4 Sharp Ends; Non-concrete Blaming [298 words]

In 1998, hundreds of people had been traveling onboard the ICE of Deutsche Bahn*. Shortly after the stop in Hanover, the tire of a wheel broke at a high speed and punctured the floor. The train conductor noticed some vibrations but did not consider them severe. Two passengers from the first wagon noticed that a piece of the cracked wheel came up through the floor. One of the two passengers was completely in shock while the other one went to report the damage to the train crew. According to the Deutsche Bahn policies, an emergency stop was only allowed after visual inspection by the train manager. Precious time elapsed by insisting on investigating the damage before stopping the train. In the meantime, the broken wheel rim slammed against the guard rail of the next switch point. The switch point was close to an overpass bridge, pulling it away from the railway track. Shortly after, the back part of the train was being slammed against the road bridge. The bridge collapsed, burying parts of the train underneath it. Of the train's twelve wagons, most were either derailed, torn in half next to the bridge, or were crushed into the bridge by the back engine. Over one hundred people died or were injured, some critically. The failure was traced back to the design and testing of Deutsche Bahn because the wheel design decisions were only based on analysis and theory. Additionally, Deutsche Bahn did not replace the wheels on time, even though they were being worn below the recommended standard in diameter. Furthermore, the emergency operation procedures of Deutsche Bahn contributed to the disaster as well. Lastly, the placement of the switch, an inherent hazard for high-speed trains, at the overpass bridge, contributed to the severity of the disaster.

*Deutsche Bahn is a German railway company

Flesch reading ease score: 66

17 sentences

Kiss Nightclub Disaster (Blaming Absent)

4 Blunt Ends, 4 Sharp Ends; Non-concrete Blaming [322 words]

In 2013, a major fire occurred at the Kiss nightclub in the city of Santa Maria, Southern Brazil. Against the club’s capacity, it was packed with at least one thousand people. The security guards let all people in who already paid for their ticket ahead. The fire started during the night. A band performing at the club let off fireworks meant for outdoor use. They did not buy the more expensive indoor fireworks. It resulted in the club’s ceiling getting ignited. Due to a malfunctioning fire extinguisher, the blaze spread throughout the packed club at lightning speed. Thick, toxic smoke got emitted. Those inside panicked as they tried to get out, but the security guards did not let them

out. The security guards could not directly evaluate the situation's severity inside. According to the club's regulation, they only let people out who paid for their drinks. The toxic smoke made the barkeeper and audience lose their sense of direction. The barkeeper started pointing people towards the emergency exit. However, the people apparently confused the bathroom doors with the exit door. The club had inflammable insulating foam material in the ceiling and faulty fire safety equipment. It had neither an alarm nor a sprinkler system and had only one emergency exit. Moreover, metal barriers used to keep people in line on their way inside ended up blocking people from getting out. Once the security guards realized how serious the fire was, they tried to help people escape. Additionally, firefighters had to open a hole in the outer wall to allow more people to escape. Many people were injured by the crush at the front door. Hundreds of youngsters were killed or hospitalized for smoke inhalation and burns. Dozens of them were in critical condition. Most of the victims were college students, who died of smoke inhalation rather than burns. The fire has the second-highest death toll for an entertainment event in Brazil.

Flesch reading ease score: 60

25 sentences

Appendix D: Calculation Tasks

Calculation Task for ICE Disaster nearby Hanover

In the following, you will have to complete a calculation task. You can see the starting number below this text. Please try to think aloud during this task by verbally repeating the first number, what you subtract from the number and what the result of each calculation is.

794

Start with 794 and count back by sevens, until the researcher says 'stop'. Please think aloud the whole time. You can start by reading out the example to the researcher.

Example: 794 - 7 = 787;

787 - 7 = ...

Calculation Task for Kiss Nightclub Disaster

In the following, you will have to complete a subtraction calculation task. You can see the starting number below this text. Please try to think aloud during this task by verbally repeating the first number, what you subtract from the number and what the result of each calculation is.

828

Start with 828 and count back by nine, until the researcher says 'stop'. Please think aloud the whole time. You can start by reading out the example to the researcher.

Example: 828 - 9 = 819;

819 - 9 = ...

Appendix E: Free Recall Tasks

ICE Disaster nearby Hanover

On the following page, you will be asked to write everything down that you remember of the ICE disaster nearby Hanover you just read.

Please click on the arrow below to continue.

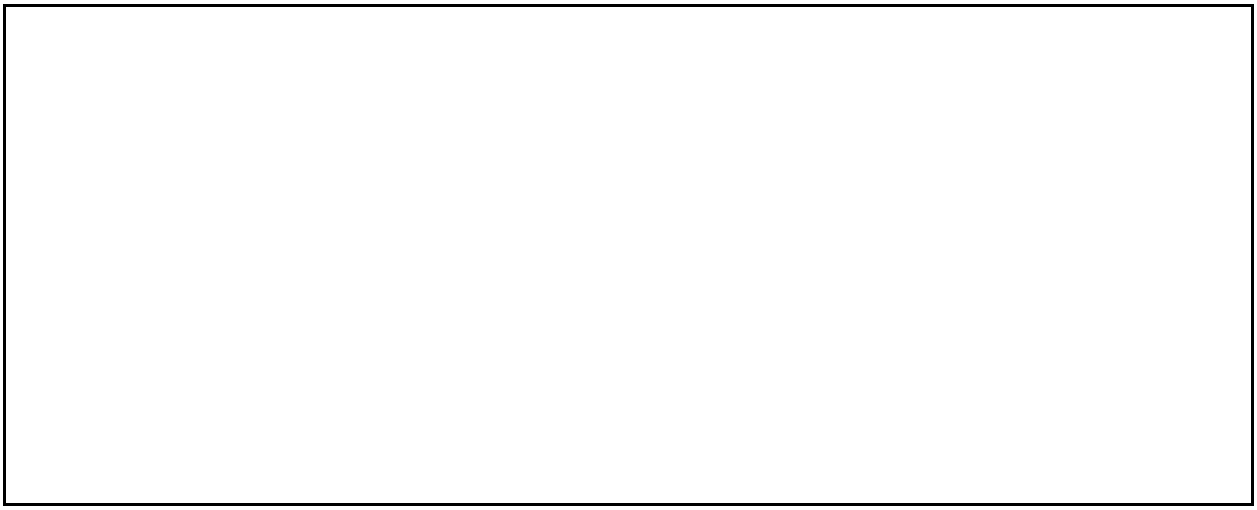
Please write down what you remember of the ICE disaster nearby Hanover.

Kiss Nightclub Disaster

On the following page, you will be asked to write everything down that you remember of the Kiss nightclub disaster you just read.

Please click on the arrow below to continue.

Please write down what you remember of the Kiss nightclub disaster you just read.



Appendix F: Responsibility Questions

Questions are on a 5-point Likert scale, with options ranging from “Not at all responsible” to “Extremely responsible” and a “Not applicable” option.

(Questions were arranged horizontally in the survey)

- Not at all responsible
- Slightly responsible
- Moderately responsible
- Very responsible
- Extremely responsible
- *Not applicable*

The responsibility questions are randomized within the block, so there was no set order in which they were presented to the participant.

CONDITION 1: SHARP END BLAMING PRESENT

ICE Disaster (Blaming Present)

Please indicate in the following questions to what extent you feel that each of the named factors were responsible for causing the ICE disaster nearby Hanover.

The train conductor mistakenly not considering the vibrations as severe.

The reluctant train manager insisting on investigating the very noticeable damage before stopping the train.

The passenger being in shock and unresponsive.

The passenger reporting the damage.

The design and testing of the wheels of Deutsche Bahn.

Deutsche Bahn not replacing the worn-down wheels ahead of time.

The emergency operation procedures of Deutsche Bahn.

The placement of the switch at an overpass bridge.

Kiss Nightclub Disaster (Blaming Present)

Please indicate in the following questions to what extent you feel that each of the named factors were responsible for causing the Kiss nightclub disaster.

The security guards thoughtlessly letting too many people into the club that paid for the ticket ahead of time.

The band irresponsibly working with cheap outdoor fireworks.

The malfunctioning fire extinguisher and fire safety equipment (no alarm nor sprinkler system).

The security guards foolishly not letting people out because they could not evaluate the situation and acted according to the club regulation.

The barkeeper pointing people toward the exit, but leading to confusion with the bathroom doors.

The club's inflammable insulating foam material.

The club only having one exit.

The metal barriers for keeping people in line on their way in blocking them from getting out.

CONDITION 2: SHARP END BLAMING ABSENT

ICE Disaster (Blaming Absent)

Please indicate in the following questions to what extent you feel that each of the named factors were responsible for causing the ICE disaster nearby Hanover.

The train conductor not considering the vibrations as severe.

The train manager insisting on investigating the damager before stopping the train.

The passenger being in shock.

The passenger reporting the damage.

The design and testing of the wheels of Deutsche Bahn.

Deutsche Bahn not replacing the worn-down wheels ahead of time.

The emergency operation procedures of Deutsche Bahn.

The placement of the switch at an overpass bridge.

Kiss Nightclub Disaster (Blaming Absent)

Please indicate in the following questions to what extent you feel that each of the named factors were responsible for causing the Kiss nightclub disaster.

The security guards letting to many people into the club that paid for the ticket ahead of time.

The band working with cheap outdoor fireworks.

The malfunctioning fire extinguisher and fire safety equipment (no alarm nor sprinkler system).

The security guards not letting people out because they could not evaluate the situation and acted according to the club regulation.

The barkeeper pointing people toward the exit, but leading to confusion with the bathroom doors.

The club's inflammable insulating foam material.

The club only having one exit.

The metal barriers for keeping people in line on their way in blocking them from getting out.

Appendix G: Demographics

What is your gender?

- Male
- Female
- Non-binary
- Prefer not to say

What is your age?

_____

What is your nationality?

- Dutch
- German
- Other, namely _____

What is your current level of education?

- Bachelor
- Master
- PhD
- Other

What is your study program/working field?

_____

Appendix H: Debrief and Data Usage

Thank you very much for participating in this research!

Now that you have reached the end of the experiment, you will be informed of the actual purpose and some of the background of this study. This is also your chance to direct any questions, or concerns, you have at the researcher.

When studying disasters, there is generally a difference made between “sharp ends”, the most immediate causes involved in a disaster, and the “blunt ends”, which includes the more distant, organizational causes. Previous research has shown that people tend to recall more sharp ends than blunt ends when reading disaster reports.

The purpose of this research is to test whether explicit blaming of the sharp ends in disaster stories influences recall. As such, you will have received either stories with such explicit blaming, or without. The data gathered from this experiment will be used to analyse if there is a difference between the group that received stories with blaming and the group that received stories without blaming.

Now that you are aware of the true purpose of this research, please indicate whether you are willing to allow your data to be used for analysis.

- ○ Yes, use my data
- ○ No, delete my data

Appendix I: Coding Schemes

Participant ID: […] ; Condition: Sharp End Blaming

ICE Disaster

Coding scheme content

		Present
Code		**Yes (1)** **No (0)**
Contextual information (14)		
1.	1a) People had been traveling onboard of ICE of Deutsche Bahn	
2.	1b) The tire of a wheel broke at a high speed	
3.	1c) The tire of a wheel punctured the floor	
4.	1d) Two passengers from first wagon noticing piece of wheel that came up through floor	
5.	1e) According to Deutsche Bahn policies, an emergency stop was only allowed after visual inspection by the train manager	
6.	1f) Precious time elapsed	

7.	1g) The broken wheel rim slammed against the guard rail of the next switch point	
8.	1h) The switch point was close to an overpass bridge	
9.	1i) The train got pulled away from the railway track	
10.	1j) The back part of the train was being slammed against the road bridge	
11.	1k) The bridge collapsed	
12.	1l) Parts of the train got buried underneath it	
13.	1m) People died or were injured, some critically	
14.	1n) The switch being an inherent hazard for high-speed trains at the overpass bridge	
Sharp end causes (4)		
1.	2a) Is 'the train conductor noticing some vibrations but not considering them severe' mentioned?	

2.	2b) Is ‘the passenger in shock’ mentioned?	
3.	2c) Is ‘the passenger reporting the damage’ mentioned?	
4.	2d) Is ‘the train manager not immediately stopping the train (due to policies)’ mentioned?	
1. Blunt end causes (4)		
1.	3a) Is it mentioned ‘that the failure was traced back to design (decisions) and testing of Deutsche Bahn as it was based only on analysis and theory’?	
2.	3b) Is ‘the missing wheel replacement on time by Deutsche Bahn mentioned even though it was worn below the diameter standard’?	
3.	3c) Is ‘the contribution of the emergency operation procedures of Deutsche Bahn to the disaster’ mentioned?	
4.	3d) Is ‘the contribution of the placement of the switch’ mentioned?	
2. Charges (2)		

1.	4a) Is it mentioned that the train conductor and train manager were charged with manslaughter?	
2.	4b) Is it mentioned that had they acted earlier, more deaths could have been prevented?	
Total score (24) ***___ out of 24***		

		Present
Code		**Yes (1)** **No (0)**
Blunt end blaming (5)		
Blaming words		
1.	a) Is it mentioned that the train conductor was 'mistaken' about the vibrations?	
2.	b) Is it mentioned that the passenger 'was unresponsive'?	

3.	c) Is it mentioned that the train manager was “reluctant”?	
4.	d) Is it mentioned that the damage was “very noticeable”?	
Total score (4) **___ out of 4**		

Kiss Nightclub Disaster

Coding scheme content

		Present
Code		**Yes (1)** **No (0)**
1. Contextual information (19)		
1.	1a) A major fire occurred at the Kiss nightclub	
2.	1b) Against the club’s capacity, it was packed with many people	
3.	1c) The fire started during the night	

4.	1d) The band did not buy the more expensive indoor fireworks	
5.	1e) It resulted in the material of the club's ceiling getting ignited	
	1f) A malfunctioning fire extinguisher*	
6.	1g) The blaze spread throughout the packed club at lightning speed	
7.	1h) Thick, toxic smoke got emitted	
8.	1i) Those inside panicked as they tried to get out	
9.	1j) The security guards could not directly evaluate the situation's severity inside	
10.	1k) According to the club's regulation, the security guards only let people out who paid for their drinks	
11.	1l) The toxic smoke making the barkeeper and audience lose their sense of direction	

12.	1m) People confusing the bathroom doors with the exit door	
13.	1n) The club not having an alarm system	
14.	1o) The club not having a sprinkler system	
15.	1p) Metal barriers used to keep people in line on their way inside	
16.	1q) Once security guards realized how serious the fire was, they tried to help people escape	
17.	1r) Firefighters had to open a hole in outer wall to allow more people to escape	
18.	1s) Many youngsters were killed or hospitalized for smoke inhalation and burns	
19.	1t) Dozens of youngsters were in critical condition	
2. Sharp end causes (4)		

1.	2a) Are ‘the security guards letting all people in that paid ahead for their ticket’ mentioned?	
2.	2b) Is it mentioned that ‘A band performing at the club let off firework meant for outdoor use’?	
3.	2c) Are ‘the security guards not letting people out of the club (according to club’s regulation)’ mentioned?	
4.	2d) Is ‘the barkeeper starting to point people towards the emergency exit, resulting in confusion’ mentioned?	
3. Blunt end causes (4)		
1.	3a) Is ‘the club’s inflammable insulating foam material’ mentioned?	
2.	3b) Is the ‘faulty fire safety equipment’ mentioned (including no alarm nor sprinkler system)?	
3.	3c) Is it mentioned that ‘the club only had one emergency exit’?	

4.	3d) Is it mentioned that the metal barriers ended up blocking people from getting out?	
4. Charges (2)		
1.	4.2a) Is it mentioned that both band and staff were charged with manslaughter?	
2.	4.2b) Is it mentioned that the band was judged the cause of the fire, and that staff actively prevented people from getting to safety?	
***Total score* (29)** **__ out of 29**		

* Ambiguous statement: could be either sharp/blunt end or context, therefore left out for coding

	Present
Code	**Yes (1)** **No (0)**
Blunt end blaming (4)	

Blaming words		
1.	a) Is it mentioned that the security guards "thoughtlessly" let in people who paid before?	
2.	b) Is it mentioned that the band "irresponsibly" used outdoor fireworks?	
3.	c) Is it mentioned that the security guards "foolishly" did not let people out?	
Total score (3) **___ out of 3**		

Participant ID: […] ; Condition: No Sharp End Blaming

ICE Disaster

Coding scheme content

	Present
Code	**Yes (1)** **No (0)**
1. Contextual information (17)	

1.	1a) People had been traveling onboard of ICE of Deutsche Bahn	
2.	1b) The tire of a wheel broke at a high speed	
3.	1c) The tire of a wheel punctured the floor	
4.	1d) Two passengers from first wagon noticing piece of wheel that came up through floor	
5.	1e) According to Deutsche Bahn policies, an emergency stop was only allowed after visual inspection by the train manager	
6.	1f) Precious time elapsed	
7.	1g) The broken wheel rim slammed against the guard rail of the next switch point	
8.	1h) The switch point was close to an overpass bridge	
9.	1i) The train got pulled away from the railway track	

10.	1j) The back part of the train was being slammed against the road bridge	
11.	1k) The bridge collapsed	
12.	1l) Parts of the train got buried underneath it	
13.	1m) Most wagons were derailed	
14.	1n) Most wagons were torn in half	
15.	1o) Most wagons were crushed into the bridge by the back engine	
16.	1p) People died or were injured, some critically	
17.	1q) The switch being an inherent hazard for high-speed trains at the overpass bridge	
2. Sharp end causes (4)		
1.	2a) Is 'the train conductor noticing some vibrations but not considering them severe' mentioned?	

2.	2b) Is ‘the passenger in shock’ mentioned?	
3.	2c) Is ‘the passenger reporting the damage’ mentioned?	
4.	2d) Is ‘the train manager not immediately stopping the train (due to policies)’ mentioned?	
3. Blunt end causes (4)		
1.	3a) Is it mentioned ‘that the failure was traced back to design (decisions) and testing of Deutsche Bahn as it was based only on analysis and theory’?	
2.	3b) Is ‘the missing wheel replacement on time by Deutsche Bahn mentioned even though it was worn below the diameter standard’?	
3.	3c) Is ‘the contribution of the emergency operation procedures of Deutsche Bahn to the disaster’ mentioned?	
4.	3d) Is ‘the contribution of the placement of the switch’ mentioned?	

Total score (25) **__ out of 25**	

Non-sharp end blaming – Just additional notes, not count in	
Blaming words	
	Present
Code	**Yes (1)** **No (0)**
Have any blaming words been used that were not mentioned in the text?	

Kiss Nightclub Disaster

Coding scheme content

	Present

Code		**Yes (1)** **No (0)**
1. Contextual information (22)		
1.	1a) A major fire occurred at the Kiss nightclub	
2.	1b) Against the club's capacity, it was packed with many people.	
3.	1c) The fire started during the night.	
4.	1d) They did not buy the more expensive indoor fireworks.	
5.	1e) It resulted in the club's ceiling getting ignited.	
	1f) A malfunctioning fire extinguisher.*	
6.	1g) The blaze spread throughout the packed club at lightning speed.	
7.	1h) Thick, toxic smoke got emitted.	

8.	1i) Those inside panicked as they tried to get out.	
9.	1j) The security guards could not directly evaluate the situation's severity inside.	
10.	1k) According to the club's regulation, they only let people out who paid for their drinks.	
11.	1l) The toxic smoke made the barkeeper and audience lose their sense of direction.	
12.	1m) The people apparently confused the bathroom doors with the exit door.	
13.	1n) The club not having an alarm system	
14.	1o) The club not having a sprinkler system	
15.	1p) Metal barriers used to keep people in line on their way inside	
16.	1q) Once the security guards realized how serious the fire was, they tried to help people escape.	

17.	1r) Firefighters had to open a hole in the outer wall to allow more people to escape.	
18.	1s) Many people were injured by the crush at the front door.	
19.	1t) Many youngsters were killed or hospitalized for smoke inhalation and burns.	
20.	1u) Dozens of them were in critical condition.	
21.	1v) Most of the victims were college students and died of smoke inhalation rather than burns.	
22.	1w) The fire has the second-highest death toll for an entertainment event in Brazil.	
2. Sharp end causes (4)		
1.	2a) Are 'the security guards letting all people in that paid ahead for their ticket' mentioned?	
2.	2b) Is it mentioned that 'A band performing at the club let off firework meant for outdoor use'?	

3.	2c) Are 'the security guards not letting people out of the club (according to club's regulation)' mentioned?	
4.	2d) Is 'the barkeeper starting to point people towards the emergency exit, resulting in confusion' mentioned?	
	3. Blunt end causes (4)	
1.	3a) Is 'the club's inflammable insulating foam material' mentioned?	
2.	3b) Is the 'faulty fire safety equipment' mentioned (including no alarm nor sprinkler system)?	
3.	3c) Is it mentioned that 'the club only had one emergency exit'?	
4.	3d) Is it mentioned that the metal barriers ended up blocking people from getting out?	
Total score (30) **__ out of 30**		

* Ambiguous statement: could be either sharp/blunt end or context, therefore left out for coding

Non-sharp end blaming – Just additional notes, not count in	
Blaming words	
	Present
Code	**Yes (1)** **No (0)**
Have any blaming words been used that were not mentioned in the text?	