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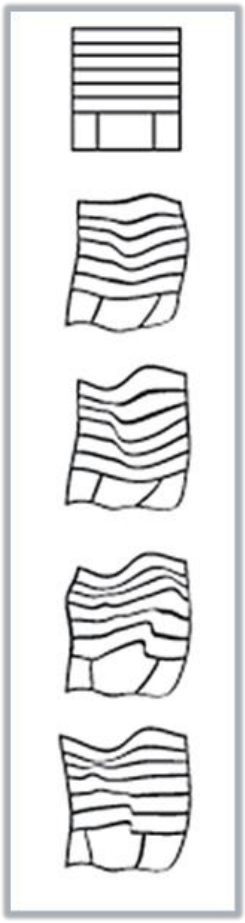

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Difference between normative and descriptive concepts on the evaluation of accident narratives

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Accident investigations are important tools in increasing industrial safety. In this paper we report an experiment evaluating the effect of evaluative concepts such as adjectives and adverbs from maritime accident narratives. We hypothesized that purely descriptive accident narrative would lead to more positive evaluations involving less blame against the involved person. An interaction effect indicated that descriptive narrative where more favourably evaluated than the normative narrative on questions involving the ability to understand the reasons and actions. The opposite was found for evaluations not involving questions on 'understanding', thus indicating a differential effect of evaluative concepts in accident narratives.

Keywords: Accident investigations, subjective evaluation, blame, narratives,

1. Introduction

Accident investigations and narratives of accidents and incidents are vital for the understanding of accident causality (Dekker, 2014) as well as for the prevention of accidents (Strauch, 2002). People often make evaluations of the actions and personnel involved in accidents. It is important to understand *if* and *how* the framing/description of accidents can affect the perception and evaluation of the incident, as this might impact on the overall evaluation of causality and on subjective responsibility for the actors involved. There are two ways to make these evaluations in written language – normative evaluations and the use of adjectives and adverbs that modify the valence of nouns and verbs in a sentence.

Normative evaluations. Normative evaluations of human actions are common (*e.g.* "*he conducted an error*"), and the attribution of subjective guilt and blame will often follow as a function of this normative labelling (Dekker, 2007). Examples such ethical/moral judgements are the normative labelling of some behaviour as "human error" (Reason, 1990), or as "complacency" (Parasuraman, Molly & Singh, 1993) or as "lack of situation awareness" (Dekker & Hollnagel, 2004).

Modifying adverbs and adjectives. Other evaluative concepts in accident investigations are adjectives and adverbs that modify nouns or verbs to describe the degree to which a verb or noun have a specific quality (e.g. 'high', 'long' or 'heavy'). For example, Harris (1973) tested the effect of different antonymous adverbs (e.g. "high" vs. "low" as in "*How ….. was the plane flying*"?) and adjectives (e.g. "hot" vs. "cold" as in "*How ….. was the temperature on his birthday*"). The findings showed that the choice of modifier clearly affected the estimates of different qualities – even though the context and the rest of the question were identical.

Loftus and Palmer (1974, experiment 1) evaluated the effect of wording of questions on the memory and understanding of accident scenarios. They showed a group of students a video of a car accident. Afterwards then verbally asked the students to estimate how fast the cars where going when they "smashed"/ "collided"/ "bumbed"/ "hit"/ or "contacted". A clear relationship between adverbs and estimated speed was seen with the adverbs indicating a more violent collision leading to a higher speed estimate ("smashed" = 40.5 mph, "collided" = 39.3

mph, ”bumped” = 38.1 mph, ”hit” = 34 mph and ”contacted” = 31.8). Thus, wording of questions affect peoples’ opinion and evaluation of accidents.

Other similar research has shown that the wording of questions also can affect people´s memory and recollection of events (Loftus, 1974, 1975; Loftus & Palmer, 1974 experiment 2). Thus, it seems that wording and how events are described are of importance for our understanding and evaluation of things such as accidents. However, according the authors’ understanding there seem to be no research papers on the effect of language used in accident reports. Henceforth, this paper seeks to investigate the effect of removing evaluative concepts like adjectives and adverbs from accident narratives.

1.2. Research Questions

This paper seeks to test whether there are differences between “normative” accident narratives (e.g narratives with adverbs and adjectives) and “descriptive” accident narratives (e.g. narratives without adverbs and adjectives). The research question is: “*How do the presence of evaluative concepts in written accident narratives affect the perception of the involved person´s actions and their subjective blame.”* We expect that purely descriptive narratives will lead to more positive and less judgemental evaluation of the involved person´s actions.

2. Method

2.1. Experimental design

The experiment was designed as a 2 x 2 split-plot repeated measures experiment. Accident narratives 1 and 2 were within-subject variables and type of accident narrative (normative vs. descriptive) was between subject variable. Participants answered 6 questions to each narrative. Hence, the research question could be answered by a between-group analysis of variance.

2.2. Accident Narratives

Two maritime accident narratives taken from actual accident investigation reports were used (AIBN, 2012; AIBN, 2013). The original text from the accident investigations was used as the normative text (with adjectives and adverbs) while removing all adjectives and adverbs from the text created the ‘descriptive’ text. The first accident narrative (AIBN, 2013) involved a machine engineer on a vessel who fell down from a ladder and hit his head. He was immediately given first aid and was later flown to hospital with a helicopter.

Table 1. Accident narrative 1 – Falling off a ladder

Normative	Descriptive
I forbindelse med en rutinemessig rengjøring av et lasterom, falt en motormann stygt ned fra en høy stige og slo hodet hardt mot tanktoppen. Vernehjelmen var ikke festet med den tilhørende hakestroppen, hjelmen falt derfor av rett før han landet ved bunnen av stigen. Undersøkelser viser at motormannen selv fjernet en påkrevd sikkerhetsline umiddelbart før fallet. Det er sannsynlig at motormannen koblet fra den påkrevde sikkerhetslinen fordi hank an ha opplevd å ha full kontroll på situasjonen og lav grad av opplevd risiko for fare så langt nede i stigen. Fjerning av sikkerhetslinen medførte også en mer bekvem klatring. Fallet var fra en slik høyde, omtrent en meter, at motormannen ble slått bevisstløs umiddelbart etter sammenstøtet. Førstehjelp ble iverksatt øyeblikkelig, og den skadde ble fraktet hurtig til skipets hospital, hvor behandlingen ble overtatt av medisinsk personell. Kort tid etter ble den skadde fraktet med helikopter til sykehus.	*I forbindelse med rengjøring av et lasterom, falt en motormann ned fra en stige og slo hodet mot tanktoppen. Hjelmen var ikke festet med hakestropp og falt av rett før han landet. Undersøkelser viser at motormannen fjernet en sikkerhetsline før fallet. Det er sannsynlig at motormannen koblet fra linen fordi han opplevde å ha kontroll på situasjonen. Fjerning av linen medførte også en bekvem klatring. Fallet, fra omtrent en meter, førte til at motormannen ble slått bevisstløs. Førstehjelp ble iverksatt og den skadde ble fraktet til skipets hospital, hvor behandlingen fortsatte. Senere ble den skadde fraktet med helikopter til sykehus.*

The second narrative (AIBN, 2012) involved a sightseeing trip to a glacier, which was part of a polar cruise. When the boat was close to the glacier the front of the glacier calved (i.e. large chunks of ice breaks off the front of the glacier) and ice hit firm ground thus being scattered violently across the area. One passenger was hit in the head and neck by ice. The boat had been about 100 meters from the glacier when it calved, and the stated safety zone was set to 200 meters.

Table 2. Accident 2 – Hit by Ice

Normative	Descriptive
Passasjerer og guider fra et større cruiseskip i polare farvann var på en vanlig dagsutflukt med lettbåtene sine innerst i en fjordarm. Mens d små lettbåtene var i nærheten av en stor isbre kalvet store deler av brefronten. Ismassene traff fast grun med høy fart og isklumper ble kastet ukontrollert i alle retninger utover det lille området med voldsom kraft. En av passasjerene om bord i en av de små lettbåtene ble truffet av flere isklumper i nakke og hoderegion.	*Passasjerer og guider fra et cruiseskip i polare farvann var på en dagsutflukt med lettbåter i en fjordarm. Mens lettbåtene var i nærheten av en isbre kalvet deler av brefronten. Ismassene traff fast grunn og isklumper ble kastet utover området. En av passasjerene om bord i en av de små lettbåtene ble truffet av isklumper i nakke og hodet.*
Guidene og passasjerene var fullt klar over at det kunne oppstå en kalving av den store brefronten og at denne kunne treffe fast grunn, men de var antageligvis ikke forberedt på at kalvingen ville bli så voldsom og kraftig. Reiseoperatørens klare instruks til guidene var å holde en trygg avstand på minimum 200 meter til brefronten, det anslås at avstanden ved ulykkestidspunktet bare var omkring 100 meter.	*Guidene og passasjerene var klar over at det kunne oppstå en kalving av brefronten og at denne kunne treffe fast grunn, men de var ikke forberedt på at kalvingen ville bli så kraftig. Reiseoperatørens klare instruks til guidene var å holde en avstand til brefronten på 200 meter, det anslås at avstanden ved ulykkestidspunktet var omkring 100 meter.*

2.3. Questionnaire

Participants answered a number of questions involving 'it is easy to understand the behaviour', 'it is easy to understand why the person did as he did', 'the involved person should have predicted the occurrence of the accident', 'the actions in the event were acceptable', 'the person showed good seamanship', and 'the person was singularly responsible for the accident'. Participants answered these statements with a 7-point likert scale where 1 indicated 'agree' and 7 indicated 'disagree'. Hence, a relatively higher score on a question will indicate a more negative and judgmental evaluation of the event and the involved person.

3. Results

A 2 (type of story) x 6 (questions) General Linear Model with repeated measures was calculated using IBM SPSS 22. A total of 102 (86 men and 14 women) students and employees at Buskerud and Vestfold University College aged 20-42 years of age (M = 24.2, SD = 4.68) participated in the study. Characterisation of effect sizes as 'small', 'moderate' or 'large' follows Cohen´s (1988) classification of effect sizes.

Results indicate a very small and insignificant difference between the marginal means of the normative (M = 3.87, 95% CI [3.67, 4.08]) and the descriptive (M = 4.02, 95% CI [3.81, 4.22]) narratives ($F_{1, 100}$ = .954, M_{diff} = 0.143, 95% CI of M_{diff} [-0.148, 0.434], p = .331, d_{av} = 0.01). Hence there was no overall effect of removal of evaluative concepts in the accident narratives. This was in direct opposition to our initial hypotheses – as we expected that people would be less appreciative (e.g. score higher) on the normative narratives

An interaction effect of small size was observed between type of narrative and questions were present ($F_{5, 500}$ = 3.857, p = .028, Eta_p^2 = .025) and this probably stemmed from the tendency that the questions containing "understanding" where answered more negatively for the normative narrative than for the descriptive narrative. For the remaining four questions the result was the other way around. The data can be seen in Table 3 that also show tests for differences between individual questions. Systematic differences (e.g. differences where the

95% CI did not include 0) of medium size between the narratives where observed for questions "The actions where acceptable" and "showed good seamanship" where the descriptive narrative scored higher – e.g. more negative. This was not in accordance with our expectations.

Table 3: Differences between Normative and Descriptive Accident Narratives

	Descriptive (N = 50)		Normative (N = 52)		Difference		
	M	95% *CI*	*M*	95% *CI*	M_{diff}	95% *CI*	d_{av}
It is easy to understand the actions	3.85	[3.42, 4.28]	4.19	[3.77, 4.61]	-0.34	[-0.94, 0.25]	0.23
It is easy to understand the reasons for these actions	3.39	[2.97, 3.81]	3.68	[3.26, 4.1]	-0.29	[-0.88, 0.29]	0.20
Should have predicted the incident	2.23	[1.91, 2.55]	2.14	[1.88, 2.41]	0.09	[-0.32, 0.5]	0.08
The actions where acceptable	5.22	[4.89, 5.56]	4.68	[4.33, 5.03]	0.54	[0.06, 1.02]	0.44
Showed good seamanship	5.75	[5.46, 6.04]	5.29	[4.97, 5.61]	0.46	[0.03, 0.89]	0.43
Alone to blame for the accident	3.65	[3.14, 4.16]	3.24	[2.84, 3.64]	0.41	[-0.23, 1.05]	0.25

Note: *M* = Mean, 95% CI = 95% confidence interval, M_{diff} = Mean difference, d_{av} = Cohen´s delta with average standard deviation $((SD_1*n_1 + SD_2*n_2)/(n_1+n_2))$ as denominator (Lakens, 2013). Systematic differences are found where the CI does not contain 0 ('zero'). Please note that a high score means ("I disagree"), hence being indicative of a less appreciating opinion (e.g. the participant has a more negative evaluation of the person involved in the accident).

To further investigate the reasons for the observed interaction effect we aggregated the two questions pertaining to "understanding" into sum scores for the two narratives. This was done because questions relating to "understanding" can be seen as indicative of the same psychological constructs empathy and ability to see things from other´s perspective. We found that the descriptive narrative (M = 6.37, SD = 3.13) where more favourably evaluated than the normative narrative (M = 8.75, SD = 3.38; t_{101} = -7.31, M_{diff} = -2.38, 95% *CI* of M_{diff} [-3.03, -1.74], d_{av} = 0.72). The effect size d indicated a moderate to large effect size. We did not aggregate the other four questions as they seemingly measure different aspects of the same event (seamanship, blame, acceptability of actions, and prediction) and hence could not be seen as aspects of a single construct.

4. Discussion

The way that accidents are described in accident reports or in conversations can impact on the evaluation of the involved persons and actions (Loftus, 1975; Dekker, 2005). We therefore compared two narratives (one normative and one descriptive) of the same incidents. We did not find support for the initial assumptions that purely descriptive narratives of accidents would be evaluated in a less judgmental way. On the contrary –to the extent that there was an overall effect - we found that purely descriptive narratives led to slightly less favourably evaluations (M = 4.02) than for the normative narratives (M = 3.87), however, this difference was very small and was not statistically significant.

An interaction effect where also present, and further post-hoc analyses showed that that questions pertaining to understanding were more positively evaluated by the people who read the descriptive narrative as compared to the normative narrative. A possible explanation for this effect is that the questionnaire where partly covering questions on the participant´s ability to understand the actions and reasoning, *i.e.* it involves the candidates ability to see the situation from another persons perspective (a type of 'internal evaluation'), while the other questions involves a more direct and the participants evaluation of some other person (i.e. a type of '*external evaluation*'). However, these indications have come as a result of post hoc evaluation of the data and can only be seen as an indication – but not as evidence for such an effect.

4.1. Limitations

Participants of this study were mainly maritime students and employees, and the accident cases were also from the maritime domain; hence reducing the generalizability of this result to the other industries.

We also removed all adverbs and adjectives – irrespective of how they modified valence. This is an experimental weakness as valences can go both ways (Harris, 1973). So, by

removing both positive and negative modifiers we probably reduce the effects that could be observed. This may explain the relative lack of systematic results.

The observation of the main effects reported in this paper is based upon post-hoc analyses and hence is not evidence for such an effect. It merely can be used to generate hypotheses that can be directly tested in new experimental research.

5. Conclusion

There seems to be no general effect of adding or subtracting evaluative concepts from a written narrative of an accident. However, for questions relating to the evaluation of actions external to the evaluator a purely descriptive narrative was found to lead to slightly more negative evaluations than the normative narrative. The opposite was found for questions asking about whether the evaluator found the actions and/or reasons understandable ('internal' evaluation) the descriptive narrative gave much more positive evaluations. This might indicate a differential effect of evaluative concepts in accident narratives. However, this test was done post hoc and requires new experiments to be properly evaluated.

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