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Topic 6: humour on Twitter

#Ebola

[THE USE OF DIFFERENT HUMOUR TYPES ON TWITTER DURING THE EBOLA CRISIS]

#Ebola: the use of different humour types on Twitter during the Ebola crisis

Abstract

Microblogs such as Twitter have increasingly been linked to crisis communication. As a result, research has aimed to gain more insight into the content of tweets during a crisis. One content type that occurs in such tweets is humour. In this study, it was investigated to what extent is there a relationship between types of humour in tweets and the persistence of a crisis. More specifically, it was explored to what extent there is a relationship between the use of different humour types and the expression of concern in tweets during different phases of the Ebola crisis. 9,033 tweets were annotated in terms of humour type and concern, after which the relationship between the two variables was considered in the early phase, the middle phase and the late phase of the Ebola crisis. A relationship was found between humour type and phase, as irony was used less than expected based on coincidence in the last phase. Overall, the most common humour types were insult and irony, although 'other humour' and 'no humour' were found more often. In terms of relation to concern, the majority of most humour types did not include any. Irony included concern more often than expected based on coincidence, but the majority of ironic tweets still included no concern at all. However, anecdotes were the only exception, as most anecdotal humorous tweets also included concern. In conclusion, the study suggests that the benign violation theory may be used to describe humour use on Twitter during crisis situations. Furthermore, the new insights in the links between anecdotes and concern, and irony and concern, may be used when future crises are analysed by organisations and governments. Crisis communication could be adjusted accordingly.

Introduction

People and organisations frequently experience situations that could be defined as a crisis, or 'an incident that is unexpected, negative, and overwhelming' (Barton, 2001, p. 2, as cited in Coombs & Holladay, 2010, p. 18). As it is important to prepare and to be able to respond to situations like this, crisis management and communication are essential. In this way, information can be shared with and processed by anyone who is affected (Coombs & Holladay, 2010).

Because of the real-time nature of microblogs such as Twitter – a website on which

users can post short text messages ('tweets') of up to 140 characters – these websites have increasingly been linked to crisis communication (Sreenivasan, Lee & Goh, 2011). Therefore, several studies have been conducted on the content of tweets during a crisis. Next to content linked to concern, for instance (Mollema et al., 2015), one type of content that occurs in such tweets is humour (McGraw, Williams & Warren, 2012; Spence, Lachlan, Lin & del Greco, 2015; Sreenivasan et al., 2011). However, little is known about when humour is used and what types of humour are used in this context.

In order to gain a better insight into how individuals communicate during a crisis, it would be relevant to find out more about the use of humour in tweets. This can help us to understand people's (online) behaviour during a tragedy and tell us when certain jokes about a crisis are considered appropriate, which could then be taken into account during future crises.

An example of a crisis that was regularly mentioned by users on Twitter, is the 2014 Ebola virus outbreak in West Africa (Odlum & Yoon, 2015). Tweets about Ebola could therefore be used to investigate the use of humour in tweets during a crisis in more detail.

Theoretical background

As mentioned above, several studies have been conducted on the content of tweets during a crisis. Sreenivasan et al. (2011), for instance, studied the different types of content that occurred in tweets during the Icelandic volcano eruption in 2010. The types of content they looked at were based on the information use environment (IUE) model by Taylor (2009, as cited in Sreenivasan et al., 2011), that classifies eight different kinds of individuals' information use to solve problems. These classes were enlightenment, problem understanding, instrumental, factual, confirmational, projective, motivational and personal. Although the results showed that enlightenment (23.5%), personal (14.7%) and problem understanding (12.2%) were the most common information uses, another common use that was not included in the IUE model was found: humour (8.1%). This substantial category suggests that humour is commonly used on Twitter during crises in order to cope with a crisis and to instil optimism; the researchers mentioned that humour may be used in order to reduce stress levels, as it was used while the users were facing problems of being stuck at airports.

As opposed to the study above, humour was already (initially) included as an

expected content type in a different study by Spence et al. (2015). The content of tweets that were sent before the landfall of Hurricane Sandy was analysed over a number of days. Information and affect display were found to be the most common tweet types, followed by humour. The use of humour, however, decreased over the number of days. On day one, this was 20%; on the last day (day four), this had dropped to 2.5%. This could possibly be explained by the idea that when the threat is significantly recognised, the situation stops being funny and expressions of fear or concern are more common.

Humour and time were also considered in another study on tweets regarding Hurricane Sandy. McGraw et al. (2012) investigated how responses to humorous tweets change over time during a crisis to 'provide clues to what makes things funny and when they will be funny' (p. 556). The results indicated that the use of humour is consistent with the benign violation theory, which explains that passage of time initially increases humour in jokes – as the threat is reduced – but further passage of time decreases the perceived humour – as too much psychological distance may make the (humorous) situation uninteresting. More specifically, the theory explains that in the case of a violation (tragedy, crisis) that is not immediately harmful and thus safe or acceptable (benign), humour can arise. However, when either the violation or benign element is omitted, a situation can be unsuccessful to be humorous: '[a] situation may be purely violating (e.g., being tickled by a creepy stranger) or purely benign (e.g., tickling oneself); neither produces humo[u]r' (p. 567). When threat is reduced because of psychological distance, therefore, humour associated with highly violating events can increase, whereas humour associated with less violating events can decrease. Thus, distance in time can make a situation more humorous when the crisis is seen as a threat (to an acceptable level), but less humorous when the threat is reduced to a level that makes it uninteresting. Based on this, it may be expected that the use of humour on Twitter in crisis situations is linked to the time frame in which a tweet is posted, as time can be seen as distance from the situation. This is of importance when looking more specifically at when and how humour is used.

Based on the same theory, which suggests there is a relationship between violation and humour, there could be a relationship between the expression of concern by Twitter users and their use of humour; when the threat (violation) of a crisis is considered high by users, more concern could be expected in their tweets to reflect this. An interpretation of the benign violation theory could be that tweets that include humour may also express a

certain level of concern, as this is an element linked to violation, a necessary element in humour during crises. On the other hand, the situation of a crisis may be seen as a threat (to an acceptable level) in a specific time frame – which allows for humour – but this concern may not necessarily be expressed in the same tweet. This, therefore, requires further investigation. Mollema et al. (2015) describe tweets that express concern as 'message[s] [that] contain[…] fear, concern, anxiety, worry, or grief about themselves or others' (p. 5). As concern would be an obvious expected content type in tweets about a crisis due to its nature, it would be wise to look at the relationship between this and the use of humour in different time frames.

Based on Heverin and Zach (2010), who found that the number of opinion-related tweets increases during the persistence of a crisis whereas the number of information-related tweets decreases, and McGraw et al. (2012), who found consistency with the benign violation theory of humour, we may expect that the use of humour increases during a crisis and eventually decreases. However, this does not say anything about the type of humour that is used. This may be of importance, as there are many different types of humour. Raz (2012) therefore attempted to automatically identify the types of humour used on Twitter. The following categories were used, based on Hay (1995): anecdotes, fantasy, insult, irony, jokes, observational, quote, role play, self-deprecation, vulgarity, wordplay and other. Little is known, however, about when and to what extent such humour types are used in crisis situations. This, therefore, requires further research; perhaps, certain humour types occur more often than others. Additionally, there may be different relationships between different humour types and concern. Raz's categories may be used again to identify the different types of humour associated with crisis situations on Twitter.

Furthermore, like humour, there are also different types of crises. As the studies mentioned above illustrate, tweets surrounding natural disasters have been investigated multiple times (McGraw et al., 2012; Spence et al., 2015; Sreenivasan et al., 2011); however, other crises such as disease outbreaks have been focused on as well, such as in the study by Mollema et al. (2015). They compared tweets about the measles outbreak in the Netherlands in 2013 (and posts on social media other than Twitter) with the number of reported news articles and measles cases. An example of a more recent disease outbreak is the Ebola virus outbreak in West Africa in 2014. The outbreak was first notified in March 2014 and is described by the World Health Organization (2016a), or WHO, as 'the largest and

most complex Ebola outbreak since the Ebola virus was first discovered in 1976' (para. 3), causing the most Ebola cases and deaths known in history. On 8 August 2014, the outbreak was declared a Public Health Emergency of International Concern by the WHO. Guinea, Liberia and Sierra Leone were the most affected countries, although the virus was spread to other countries as well. It may be said that this crisis has both a violation element (seeing the seriousness of the crisis and the risk of spreading) and a benign element (as the crisis was relatively far away from the West and this study will focus on Dutch tweets). Users on Twitter regularly tweeted about this crisis (Odlum & Yoon, 2015) and it may therefore be seen as a suitable crisis to investigate.

As crisis communication is absolutely important during the persistence of a crisis and in crisis management (Coombs & Holladay, 2010), it is of importance that the use of humour on Twitter during crises is investigated further. Based on the benign violation theory, this may be linked to the phase of a crisis and to concern. A better insight into individuals' (humorous) online communication about Ebola can help us to understand people's behaviour during a tragedy and tell us when which jokes about a crisis are considered appropriate.

Research questions

In order to gain an insight into the use of different humour types on Twitter during a crisis, the following general research question was proposed:

RQ: To what extent is there a relationship between types of humour in tweets and the persistence of a crisis?

In order to investigate this more deeply – focussing on Ebola, different time frames and relating humour to another content type – the following sub-questions will be explored:

RQ1: To what extent is there a relationship between the use of humour and the expression of concern in tweets during the early phase of the Ebola crisis?

RQ2: To what extent is there a relationship between the use of humour and the expression of concern in tweets during the middle phase of the Ebola crisis?

RQ3: To what extent is there a relationship between the use of humour and the expression of concern in tweets during the late phase of the Ebola crisis?

Method

Materials

In order to answer the research questions above, a corpus analysis was conducted. The corpus consisted of 28,158 Dutch tweets (posts by any user on Twitter.com) about the Ebola virus, posted between 22 March 2014 and 1 October 2015. These were retrieved from twiqs.nl and were selected based on the use of the word 'Ebola' or the *hashtag* Ebola *(#Ebola)*. Using simple random sampling, 9,033 of them were annotated.

Prodedure

The tweets were coded by twenty Business Communication students on the expression of concern and the type of humour that was used. For the variable relating to concern, the definition by Mollema et al. (2015) was applied: 'message[s] [that] contain[…] fear, concern, anxiety, worry, or grief about themselves or others' (p. 5). For the purpose of this study, however, only the aspects 'fear', 'anxiety' and 'worry' were used to define whether a tweet included concern (1. yes; 2. no). The different humour types were based on the ones Raz (2012) used in his study, although it is important to note that each tweet was only coded as one humour type. The codes and definitions of these types (based on the definitions by Hay, 1995; quoted from MacMillan Dictionary, n.d.) were used as coding guidelines and can be found in Table 1. A thirteenth type was added to classify tweets that did not include any humour.

Table 1.   Humour types and definitions based on Hay (1995) and Raz (2012)

Humour type	Definition from MacMillan Dictionary (n.d.)
1. Anecdote	'a story that you tell people about something […] funny that has happened to you'
2. Fantasy	'a story that shows a lot of imagination and

	is very different from real life'
3. Insult	'an offensive remark'
4. Irony	'a form of humour in which you use words to express the opposite of what the words really mean'
5. Joke	'a short story that is funny at the end. The last line of the joke is called the punchline'
6. Observational	'a [...] comment about something that you have seen, heard, or felt'
7. Quote	'words that someone else has said or written'
8. Role-play	'an activity in which you pretend to be someone else'
9. Self-deprecation	comment in which you 'show[...] that you think you are not very good or important'
10. Vulgarity	'joke[...], action[...] etc with a sexual meaning that is considered to be rude or offensive'
11. Wordplay	'clever or funny use of words'
12. Other	Any other type of humour that does not match types 1-11.
13. No humour	No humour at all

The coding was used to determine the use of humour and concern in three different time frames that signify the persistence of the crisis, so the consistency with the benign violation theory of humour could be considered. They were chosen based on information from the WHO (2016a). The first time frame, the early phase, consisted of tweets from 22 March 2014 – 31 July 2014 (± five months), starting after the first cases were notified and ending just before the outbreak was declared a Public Health Emergency. The second time frame, the middle phase, was from 1 August 2014 – 30 April 2015 and started a week before the outbreak was declared a Public Health Emergency. This phase included the main peaks of the crisis. Because the early phase consisted of five months, it was decided to pick a third

time frame of the same length. The late phase, therefore, consisted of tweets from five months again: 1 May 2015 – 1 October 2015.

Before the real coding, all raters coded the same 20 tweets as examples so any problems and interpretations of the guidelines could be discussed. As the corpus was then independently coded by twenty raters who coded 500 tweets each, 967 tweets were coded twice (by two different raters) in order to establish the interrater reliability. A Cohen's Kappa was calculated for each variable. The interrater reliability of the variable 'humour type' was low: $\kappa = .31$; for the variable 'concern', this was low as well: $\kappa = .37$. Any mismatches were recoded based on the guidelines that can be found in Appendix 1. For humour type, it was important to first of all check whether humour was involved. When a tweet consisted of an anecdote or role-play, but did not include any humour, this was coded as 'no humour' rather than 'anecdote' or 'role-play'. Additionally, in order to be classified as humour type 'irony', the tweet had to mean the opposite of what was said. Moreover, 'jokes' had to include a punchline. For concern, the most important guideline was that when a tweet consisted of news or a headline, it should be coded as 'no concern'. Insults were not coded as concern either.

Statistical treatment

In order to answer the research questions, several Chi-Square tests were carried out. All analyses were conducted with SPSS 22.

Results

Figure 1 shows the total number of tweets during the persistence of the crisis from 22 March 2014 – 10 October 2015 and the number of tweets that included humour. The first peak was on 8 August 2014, when the Ebola outbreak was officially declared a Public Health Emergency. The highest peaks followed on 6 October, the day the first human-to-human transmission of Ebola outside Africa was confirmed in Spain, 14 October, when the WHO held its Virtual Press Conference on Ebola, and 15 October, the day after the press conference. The last peak was at the end of November 2014, shortly after the end of the Ebola outbreak in Congo was declared by the WHO (World Health Organization, 2016b). Thus, all main peaks were within the middle phase.

As Figure 1 illustrates, the number of tweets in the early phase was very low, which

means that other results from this phase may not be that relevant. The highest peak was on 31 July, which was the day on which communities in West Africa were reached out to about Ebola as outbreak numbers were increasing. The other, lower peak in May was a few days before the first Ebola cases in Sierra Leone were confirmed (World Health Organization, 2016b). Most humour was found on 21 May, but even that count was only 8.

Similarly, only a low number of tweets was found in the late phase, which means any results from this phase may not be very relevant either. The main 'peaks' in this phase were on 1 May and 31 July 2015 –nothing particularly striking was reported on these days by the WHO (World Health Organization, 2016b).

Figure 1.   Total number of tweets and number of tweets including humour during the persistence of the Ebola crisis
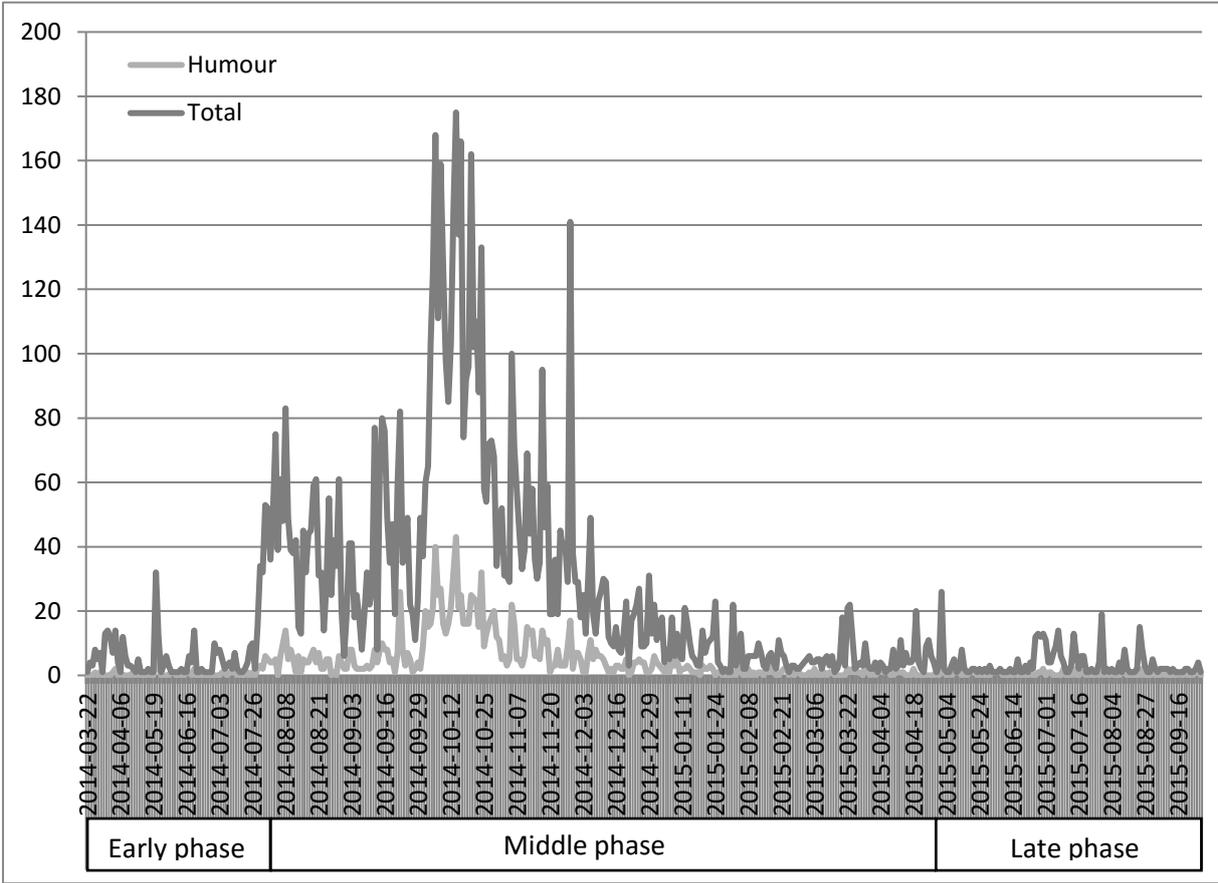
Overall, 16.4% of all 9,033 tweets included humour. Most of these were classified as the type 'other' (6.0%). Of the other humour types, insult (2.7%) and irony (2.4%) were found most frequently. These results can be found in Table 2. Certain humour types were barely found (< 1.0%); due to the moderately low numbers of tweets that included the types role-play (0.1%), self-deprecation (0.2%), vulgarity (0.3%), quote (0.3%), wordplay (0.5%) and fantasy (0.6%), these types were disregarded in future analyses. Of all tweets, 16.5% included expression of concern.

A Chi-Square test found a significant relationship between the phase of the crisis and the humour type that was used (χ^2 (24) = 37.31, *p* = .041). However, the only significant difference was found in the late phase (based on standardised residuals): significantly less irony was found in this phase than expected. All percentages and standardised residuals can be found in Table 2.

Table 2.   Relation between humour type in tweets and phase of the Ebola crisis

Humour type	Early phase	Middle phase	Late phase	Total
Anecdote (*N* = 90)				
% within phase/total	.7	1.0	.5	1.0
Standardised Residual	.7	.3	-.9	
Insult (*N* = 241)				
% within phase/total	1.4	2.7	3.0	2.7
Standardised Residual	-1.7	.3	.4	
Joke (*N* = 108)				
% within phase/total	.7	1.3	.5	1.2
Standardised Residual	-1.0	.5	-1.1	
Irony (*N* = 213)				
% within phase/total	1.6	2.5	.5	2.4
Standardised Residual	-1.1	.7	-2.2	
Observational (*N* = 102)				
% within phase/total	.2	1.2	.3	1.1
Standardised Residual	-1.8	.7	-1.5	
Other (*N* = 541)				
% within phase/total	4.5	6.1	6.3	6.0
Standardised Residual	-1.3	.2	.3	
No humour (*N* = 7555)				

% within phase/total	89.6	83.2	86.5	83.6
Standardised Residual	1.4	-.4	.6	
Total (*N* = 9033)*	100.0	100.0	100.0	100.0

*Total includes humour types that were disregarded

Another Chi-Square test showed a significant relation between humour type and concern in all annotated tweets (χ^2 (12) = 184.10, $p < .001$), of which the results can be found in Table 3. Significant differences were found in the types anecdote, insult, joke, irony and observational. In almost all of these categories, the majority of tweets did not include concern. For insults, there were less tweets (8.3%) that included concern than expected. The same was true for jokes (8.3%) and observational humour (7.8%). In ironic tweets, more concern (24.4%) was found than expected, although the majority of tweets still did not include concern (75.6%). There was one humour type for which the opposite was true: when anecdotal humour was used, the majority (58.9%) of these tweets included expression of concern as well, which was significantly more than expected. Similarly, there were significantly less tweets of this type than expected that did not include concern. No significant relation was found for the humour type other and no humour (based on standardised residuals).

Table 3.   Relation between humour type and concern in all annotated tweets

		Concern		
Humour type		No	Yes	Total
Anecdote (*N* = 90)				
	% within humour type	41.1%	58.9%	100.0%
	Standardised Residual	-4.4	9.9	
Insult (*N* = 241)				
	% within humour type	91.7%	8.3%	100.0%
	Standardised Residual	1.4	-3.1	
Joke (*N* = 108)				
	% within humour type	91.7%	8.3%	100.0%
	Standardised Residual	.9	-2.1	
Irony (*N* = 213)				
	% within humour type	75.6%	24.4%	100.0%
	Standardised Residual	-1.3	2.9	
Observational (*N* = 102)				
	% within humour type	92.2%	7.8%	100.0%
	Standardised Residual	1.0	-2.1	
Other (*N* = 541)				
	% within humour type	85.4%	14.6%	100.0%

No humour (N = 7555)		No	Yes	Total
	Standardised Residual	.5	-1.1	
	%within humour type	83.3%	16.2%	100.0%
	Standardised Residual	.2	-.6	
Total (N = 9033)*				
	% within humour type	83.5%	16.5%	100.0%

*Total includes humour types that were disregarded

Humour type and concern: early phase of Ebola crisis (RQ1)

Of the 443 tweets posted during the early phase of the Ebola crisis, 10.4% included humour, which can be found in Table 2. Similar to the overall results, most humorous tweets were classed as 'other' (4.5%). Irony was found most often after that (1.6%), followed by insult (1.4%). 16.9% of tweets included concern.

A Chi-Square test showed a significant relation between humour type and concern (χ^2 (9) = 29.36, p = .001). All humorous tweets of the type anecdote included concern, which was significantly more than expected (based on standardised residuals). No significant relation was found between the other humour types and concern. An overview can be found in Table 4.

Table 4.   Relation between humour type and concern in tweets during early phase of Ebola crisis

Humour type		Concern		
		No	Yes	Total
Anecdote (N = 3)				
	% within humour type	0.0%	100.0%	100.0%
	Standardised Residual	-1.6	3.5	
Insult (N = 6)				
	% within humour type	100.0%	0.0%	100.0%
	Standardised Residual	.5	-1.0	
Joke (N = 3)				
	% within humour type	66.7%	33.3%	100.0%
	Standardised Residual	-.3	.7	
Irony (N = 7)				
	% within humour type	85.7%	14.3%	100.0%
	Standardised Residual	.1	-.2	
Observational (N = 1)				
	% within humour type	100.0%	0.0%	100.0%
	Standardised Residual	.2	-.4	
Other (N = 20)				

|				
	% within humour type	90.0%	10.0%	100.0%
	Standardised Residual	.3	-.8	
No humour (*N* = 397)				
	% within humour type	83.9%	16.1%	100.0%
	Standardised Residual	.2	-.4	
Total (*N* = 443)*				
	% within humour type	83.1%	16.9%	100.0%

*Total includes humour types that were disregarded

Humour type and concern: middle phase of Ebola crisis (RQ2)

Table 2 shows that 16.8% of the 8,226 tweets posted during the middle phase of the Ebola crisis included humour, of which 6.1% was classified as other, 2.7% as insult and 2.5% as irony. 16.8% of tweets included expression of concern.

Figure 2 illustrates the number of tweets with humour and the number of tweets with concern in the middle phase of the crisis. The numbers are considerably higher than in the previous phase. The peaks that were visible in Figure 1 can be seen a bit more clearly.

Figure 2.   Number of tweets with humour and number of tweets with concern in the middle phase of the Ebola crisis
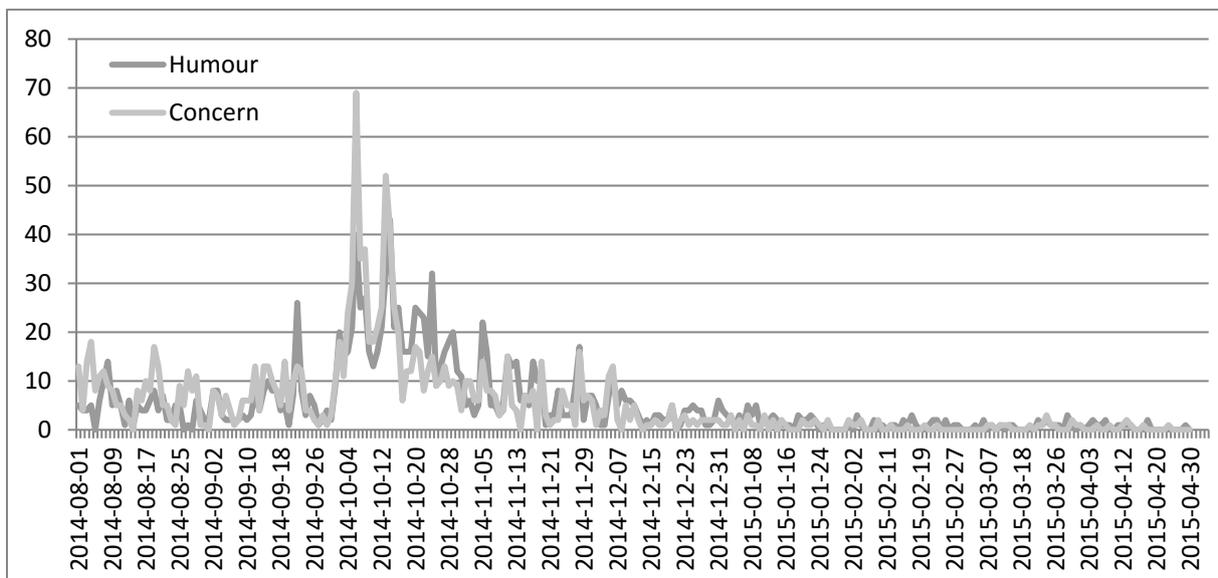
A Chi-Square test showed a significant relationship between humour type and concern (χ^2 (12) = 148.33, *p* < .001. Except for the type anecdote, the majority of each humour type did not express concern as well. Significantly less concern than expected was

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found in jokes (7.8%), observational humour (8.0%) and insults (8.5%). For irony, significantly more concern (24.5%) was found than expected, although the majority of ironic tweets still did not include concern. For anecdotes, a majority of 56.5% did include concern, which was significantly more than expected; similarly, anecdotal tweets with no concern appeared significantly less. No significant relations were found for other humour and no humour (based on standardised residuals, see Table 5).

Table 5.   Relation between humour type and concern in tweets during middle phase of Ebola crisis

Humour type		Concern		Total
		No	Yes	
Anecdote (*N* = 85)				
	% within humour type	43.5%	56.5%	100.0%
	Standardised Residual	-4.0	8.9	
Insult (*N* = 224)				
	% within humour type	91.5%	8.5%	100.0%
	Standardised Residual	1.4	-3.0	
Joke (*N* = 103)				
	% within humour type	92.2%	7.8%	100.0%
	Standardised Residual	1.0	-2.2	
Irony (*N* = 204)				
	% within humour type	75.5%	24.5%	100.0%
	Standardised Residual	-1.2	2.7	
Observational (*N* = 100)				
	% within humour type	92.0%	8.0%	100.0%
	Standardised Residual	1.0	-2.1	
Other (*N* = 498)				
	% within humour type	84.9%	15.1%	100.0%
	Standardised Residual	.14	-.9	
No humour (*N* = 6843)				
	% within humour type	83.4%	16.6%	100.0%
	Standardised Residual	.1	-.3	
Total (*N* = 8226)*				
	% within humour type	83.2%	16.8%	100.0%

*Total includes humour types that were disregarded

Humour type and concern: late phase of Ebola crisis (RQ3)

As illustrated in Table 2, 13.5% of the 364 tweets posted in the late phase of the crisis

included humour, of which 6.3% was classified as other. Humorous insults accounted for 3.0%, whereas all other humour types accounted for less than 1.0% each. In 9.1% of tweets, concern was expressed.

A Chi-Square test showed a significant relationship between humour type and expression of concern (χ^2 (10) = 47.73, p < .001). All anecdotal humorous tweets included concern, which was significantly more than expected (based on standardised residuals). For irony, exactly 50% included concern, which was also significantly more than expected. No other significant relations were found, which can be seen in Table 6.

Table 6.   Relation between humour type and concern in tweets during late phase of Ebola crisis

Humour type		Concern No	Yes	Total
Anecdote (*N* = 2)				
	% within humour type	0.0%	100.0%	100.0%
	Standardised Residual	-1.3	4.3	
Insult (*N* = 11)				
	% within humour type	90.9%	9.1%	100.0%
	Standardised Residual	.0	.0	
Joke (*N* = 2)				
	% within humour type	100.0%	0.0%	100.0%
	Standardised Residual	.1	-.4	
Irony (*N* = 2)				
	% within humour type	50.0%	50.0%	100.0%
	Standardised Residual	-.6	1.9	
Observational (*N* = 1)	% within humour type	100.0%	0.0%	100.0%
	Standardised Residual	.1	-.3	
Other (*N* = 23)				
	% within humour type	91.3%	8.7%	100.0%
	Standardised Residual	.0	-.1	
No humour (*N* = 315)				
	% within humour type	92.4%	7.6%	100.0%
	Standardised Residual	.3	-.9	
Total (*N* = 443)*				
	% within humour type	83.1%	16.9%	100.0%

*Total includes humour types that were disregarded

Conclusion and discussion

The purpose of this study was to investigate to what extent there is a relationship between types of humour in tweets and the persistence of a crisis, and more specifically to what extent there is a relationship between the use of humour and the expression of concern in tweets during different phases of the Ebola crisis. First of all, an important finding was that there was a large difference between the low number of tweets posted in the early and late phase of the crisis, and the high number of tweets posted in the middle phase. This was to be expected due to the main events that happened during that phase, such as the official declaration of Ebola as a Public Health Emergency and the confirmation of the transmission of Ebola outside of Africa (World Health Organization, 2016a, 2016b). The results suggest that there was more interest in the crisis once the outbreak became more serious but was still relatively far away from the Dutch Twitter users, and interest was lost once the crisis was too far away due to passage of time.

Although the percentage of humour used increased in the middle phase and decreased again in the late phase, this was not a significant difference – perhaps due to the difference in total number of tweets in each phase. There was, however, a significant difference in use of irony – significantly less irony was found in the late phase than expected based on coincidence. This could possibly be explained by the idea that once the seriousness of the situation had become clear but the crisis had become less interesting due to passage of time, it was not considered funny anymore to describe the situation ironically. Irony possibly requires more scepticism towards a situation than any other humour type, and this might not have been present as much anymore in the late phase. In terms of passage of time, the study may therefore suggest that an effect of the benign violation theory was present in ironic humour, but it does not confirm it for any other humour types as their differences between phases were not significant. The benign violation theory explains that passage of time initially increases humour, as the threat is recognised but still acceptable, but further passage of time decreases humour, as the situation becomes less interesting (McGraw et al., 2012).

The most common humour types were 'other', insult and irony – however, most tweets were coded as 'no humour'. Because humorous tweets were often coded as other, this suggests that it was either hard to recognise categories 1-11, or they were not complete.

Overall, there were less insults, jokes and observational humorous tweets that included concern than expected based on coincidence. In ironic tweets, more concern was found than expected based on coincidence – perhaps again because of the scepticism that is often involved in irony – although the majority still did not include concern, similar to most other humour types. The only exception was anecdotal humour, since it was the only humour type of which the majority included concern. Significantly more concern was expressed in these tweets than expected based on coincidence and significantly less anecdotal tweets did not include concern. Because anecdotes are stories (Hay, 1995; MacMillan Dictionary, n.d.), they are often quite personal; this finding may therefore be explained by the expression of (more) personal feelings in anecdotes. It would be more logical to express concern in a funny personal story than it would be to do so when insulting somebody, for example.

In terms of different time phases, the middle phase results were extremely similar to the overall results – the same humour types were found most often and the same humour types stood out in the same way: irony and anecdote. Again, this could be explained by the total number of tweets that was found in this phase compared to the total number of observed tweets. In the early and late phases, anecdotes were again accompanied by concern more often than expected based on coincidence. Thus, whether or not anecdotes are accompanied by concern does not seem to depend on passage of time. In the late phase, more irony was used than expected, although this was based on two ironic tweets only. Because of the low number of tweets in the early and late phase, the significant results in these phases should perhaps not be generalised too much.

However, it is still clear that there was a relation between humour and concern, especially in the middle phase. When the threat of a crisis is considered high by users, more concern would be expected in their tweets to reflect this. Most of the time, humorous tweets did not include concern, which would suggest that even if there was indeed a recognised, acceptable threat and humour was increased, this threat did not become clear from the humorous tweet itself. However, as more concern was present in anecdotes, this may suggest that this type of humour is particularly linked to concern and thus threat; it may therefore be implied that a violation element in the tweet itself is often necessary in order for anecdotal humour to work.

Furthermore, it should be noted that there were several limitations to this study. Firstly, the early and late phase included very low numbers of tweets, which makes it hard to

properly interpret and generalise any findings within these phases. Secondly, the interrater reliability of both the variables humour type and concern was rather poor. This could mean that the coding guidelines were not clear enough and, most importantly, that the results are not completely accurate. This also seems to be the case based on the high number of tweets coded as 'other humour'.

For future research, it would be recommended to investigate humour types again and to perhaps focus on the difference between anecdotal humour and other humour types in relation to concern. Moreover, different time frames with higher numbers of tweets could be used in order for them to be more comparable. Finally, Raz's (2012) humour types may be used again; however, if a similar coding system is used, it may be advised to set up proper coding guidelines including the recoding guidelines that were used in this study, and to practise these guidelines several times before starting the final coding. In this way, a higher interrater reliability could be established and less tweets might be coded as 'other humour'. Alternatively, a simpler coding system may be used.

In conclusion, certain humour types are used differently from others on Twitter during a crisis in terms of time frame and relation to concern. The current study suggests that the benign violation theory may be used to describe humour use on Twitter during crisis situations. There was an initial increase in total numbers of tweets that included humour and an eventual decrease as time passed; however, these differences were not significant based on statistical tests. More specifically, the study has aimed to investigate different humour types in this aspect and their relation to concern. Results imply that insults and irony are the most popular humour types to use on Twitter during a crisis, which is a new insight – when managing future crises, governments and organisations could take this into account. The most important new insight is that although most humorous tweets are not accompanied by concern, anecdotal tweets are significantly different in this aspect. They are most commonly seen together with expression of concern as the only one of Raz's (2012) humour types. Irony may include concern more often than expected as well. This information can be used when future crises are analysed by organisations and governments, as much use of anecdotal and ironic humour may mean that much concern is present. When this is known, communication regarding the crisis could be adjusted in order to match the situation better.

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Appendix 1: general guidelines for the recoding of the variables humour type and concern in tweets

Humour type guidelines	Expression of concern guidelines
First step: is humour involved? When a tweet consists an anecdote or role-play, but no humour is included: no humour	News/headline: no concern
When a user mentions an insult but is not actually insulting somebody him/herself, it is not classified as insult ('this weekend someone called me lola-ebola – that's definitely going in my top 3': anecdote)	News with added text from user that expresses concern: concern
If someone is very obviously being insulted in a humorous way (even if it could be seen as ironic): insult	Calling for help/support or expressing concern for yourself or others: concern
If the rater feels like there is humour involved but it does not clearly match any of the specific types: other	Insults, hate and/or swearing ('get Ebola'): no concern
If a tweet mentions something funny that is (supposedly) happening in the world: observational In order to be classified as humour type 'irony', the user must mean the opposite of what is said.	Critisising method (e.g. treating Ebola): no concern Warning: concern
In order to be classified as humour type 'joke', the tweet must include a punchline. If a user negatively comments on another user's joke without using humour him/herself: no humour	Rules regarding Ebola control (e.g. 'Ebola check for travellers from Nigeria to Schiphol'): no concern Wondering whether ebola is dangerous: concern
	Memorialising people who have passed away: concern ('Dear, 5 co-authors of article about #ebola today have now died because of the virus')
	Unclear whether the tweet is news or not but includes a hashtag such as #news: treat as news, so no concern
	Fear for the spread of Ebola: concern
.	Tweets from which it is not clear what is meant ('What did I tell you about ebola?'): no concern