

The impact of language and cognition on compliance during a natural disaster

Final report to the Leverhulme Trust

28 March 2011

1. The Grant

Dates

1st September 2008 – 30th September 2010

Budget

£93,472 (Ref: F/070 40/AM)

Personnel

- Dr Gabriella Rundblad, Principal Investigator, 6.5 hours/week
- Professor Paul Hunter, Co-Applicant, 2 hours/week
- Ms Olivia Knapton, Research Assistant, 100% for 20 months
- Ms Jo Van Herwegen, Research Assistant, 50% for 1 month
- Mr Alistair Cullen, Clerical Assistant, 33% for 3 months
- Mrs Anne Conde, Research Assistant, 50% 4 months

Sites

- Education and Professional Studies, King's College London (KCL), London SE1 9NH
- Medicine, Health Policy and Practice, University of East Anglia, Norwich NR4 7TJ

2. Objectives

Summer 2007, Gloucestershire experienced heavy rainfall and severe flooding. Due to flooding of Mythe water treatment works, approximately 340,000 people were left without mains water for weeks; when water was returned, consumers were first issued a 'Do Not Drink' notice, followed by a 'Boil Water' notice. This project aimed to:

- A. Investigate the level of public compliance with and understanding of the two notices, highlighting factors governing non-compliance, e.g., demographics, use of information sources, previous experience and general folk beliefs;
- B. Explore how the language of official and media-communicated advice contributed to public understanding and compliance;
- C. Work with the water industry to improve consumer communication;
- D. Further develop a linguistic analysis method that better incorporates shared, public cognition.

3. Research Activity

Only minor changes were made to the project, once underway. Additionally, we were able to run a small parallel study funded by the Drinking Water Inspectorate (DWI) on a routine incident, which allowed greater insight into the effects of the natural disaster on compliance. In order to achieve our objectives, the project comprised three stages:

Consumer Survey

Eighteen months after the incident, a postal questionnaire was sent to 1000 randomly selected households affected. It queried basic demographics, what information consumers remembered receiving, information sources used, degree of satisfaction with information and activities performed with mains water during each notice period. Non-responders were sent a reminder after four weeks. A response rate of circa 20% (common for postal surveys) was achieved. Inferential analysis was carried out using Chi-square, ANOVA, (for repeated measures) generalised estimating equations with and without prior factor analysis, and (for analyses with multiple outcome variables) MANOVA.

The 18-month time lag may have affected respondents' recall; however, the incident was of an unprecedented magnitude and focus groups revealed highly detailed recall.

Linguistic Analysis

Printed drinking water information available to consumers from authorities and media was collected. Texts were grouped by source (authority, local media, and national media) and by publication period (loss, first notice, second notice, and all clear). Authority texts were analysed, but excluded from comparisons due to low numbers. We performed corpus linguistic analysis using the Linguistic Inquiry and Word Count software (LIWC) on 142 media texts containing some water advice. Statistical analysis was through MANOVAs. LIWC analysis was added to the project to allow rapid processing of the full corpus and to yield a solid overview of information patterns and general rhetorical strategies. Cognitive discourse analysis (CogDA; a new technique devised by Rundblad) was manually performed on a random selection of 80 texts. CogDA explores the roles and actions of the authorities and the general public, revealing which participants/entities are highlighted or downplayed. Quantitative analysis was mainly descriptive.

Interviews/Focus groups

Interviews with the Drinking Water Inspectorate (DWI) provided detailed information about the incident, in particular the timing and reasoning behind the two notices, as well as copies of the notices and details on areas affected. To establish how information flow was managed between authorities and media, we conducted interviews with media representatives, including BBC Gloucestershire.

Three focus groups were conducted with consumers, authorities (i.e., representatives from DWI, Severn Trent Water (STW), Health Protection Agency (HPA), and Gloucestershire PCT, and a mixed group which select members from the other two groups. In addition, we added interviews with select respondents from the questionnaire to our design, in order to get richer, qualitative data about experiences of the incident. Interview/Focus group analysis followed standard practise.

4. Conclusions and Achievements

Objective A

Generally, demographics and choice of information source did not affect compliance. Nevertheless, consumers preferred information received from local radio and family/friends

– more so than the official leaflets, which were significantly underused by the elderly and those in employment. Authorities should evaluate and adjust their communication plans accordingly.

As hypothesised, non-compliance was higher for 'Do Not Drink' (62.9%) compared to 'Boil Water' (48.3%). This was partly because 'drink' was not interpreted to include all types of ingestion, and partly because consumers boiled mains water before ingestion, believing boiling rendered it safe. Similarly, many believed more than one water notice can be in place simultaneously. Public health education needs to target knowledge and folk beliefs about precautionary actions, and we also advise that the 'Do Not Drink' title be revised to encapsulate the dangers of all ingestion activities, e.g. 'External Use Only'.

Furthermore, non-compliance for this incident was significantly higher than for the routine incident, suggesting an even greater need for consumer-appropriate communication for high-impact events.

Objective B

Local media reports were more detailed and plentiful throughout the incident, and consumers felt their advice was clearer. However, local and national media seemed unsure of STW's role and responsibilities, and reports tended to present the emergency services and the military as more certain, prominent and authoritative. This may have caused confusion, reduced public confidence in STW's capabilities, and harmed trust in their advice. This is particularly damaging since advice directly from STW was typically deemed more informative by consumers.

Media texts also attributed the public with low degrees of certainty, and like STW, they were generally obscured. This may have reduced public responsibility to follow advice, presenting it as an option rather than an obligation. Similarly, consumer focus groups reported a need for more explicit instructions, using words such as 'must'/'should'. Low compliance may also have been caused by the word 'use', a vague action, less clear than 'drink'/'boil'. 'Use' was highly frequent throughout the incident, regardless of which notice was in place, and it was commonly combined with a dense reporting style, best suited to more literate/educated consumers.

Objective C

In addition to close collaboration/interviews/focus groups with DWI and STW, and dissemination of conclusions at industry oriented conferences, the team organised a well-received knowledge transfer/industry workshop, addressing current communication challenges in the UK. Rundblad was also invited to address the Centers for Disease Control (CDC) and American Water Works Association (AWWA) at a US water notice revision meeting..

Objective D

Rundblad's method of text analysis was successfully extended from academic medical discourse to media and industry discourses of public health.

Original contribution

This is the first project to compare compliance to two different water notices. It also adds substantial weight to the small selection of studies looking at compliance during a natural disaster and is one of only two studies of 'Do Not Drink' notices. While previous studies have typically investigated the effect of information sources and trust on compliance, this is the first project to also include the effects of public understanding of risk and interpretation of the language used in official advice and media. The project has further expanded knowledge of folk beliefs about water and their strong ties to key terminology, thus highlighting the need for a cognitive linguistic approach in public health.

Significance

This project has yielded a wide range of conclusions and associated recommendations relevant to national and international water industries, and information about presentations and publications has been spread by word-of-mouth, via e-mails and on the internet by professionals. By linking the language of health communication with shared cognition, perception and behaviour and highlighting the impact of linguistic techniques/preferences, our findings have implications across many disciplines such as public health communication in general and cognitive psychology.

To-date, our first article has been accessed 1,365 times since its publication on 25/10/2010, and has been nominated for the 5th BMC Annual Research Award in Medicine. In the wake of our disseminations, our conclusions have already influenced changes to water notice procedures and formats in the UK and the US.

Methodologically, this specific combination of qualitative and quantitative methods and especially the validation of CogDA in public health have pushed health communication in a new exciting direction. Further, the empirical evidence provided by analysis of real world data has reinforced existing cognitive theories, reconciled the often disjointed fields of cognitive linguistics and discourse analysis, and paved the way for future studies in an even wider range of practical contexts.

Personal Evaluation

Overall, the research team were very pleased with the outcomes of the project. In particular, CogDA offered new insights into shared cognition of health beliefs about water. It also shed light on conceptualisations of different authorities, provided evidence of both helpful and unhelpful reporting styles during emergencies and showed how these may affect compliance to advice. A higher response rate to the questionnaire may have improved reliability of the compliance results; however, our questionnaire findings were reinforced by the consumer focus groups. While information on how incident information was transferred from the authorities to the media was obtained from local media sources, more detailed interviews with key media figures at national level would have been useful. Perhaps the most successful element of the project is its practical application to the work of the water industry. Securing funding to compare compliance between two incidents shows the value of insights into public perceptions and behaviours. In addition, sharing the linguistic findings with the water industry has enabled them to consider their advice from a new perspective and to feed these findings into revisions of water notices.

5. Publications and Dissemination

Publications

- Rundblad, G., Knapton, O & P.R. Hunter. (2010). Communication, perception and behaviour during a natural disaster involving a 'Do Not Drink' and a subsequent 'Boil Water' notice: a postal questionnaire study. *BMC Public Health* 2010, 10:641.
- Knapton, O., Hunter, P.R. & G. Rundblad. (in preparation). Do the causes and circumstances of water notices impact consumer behaviour?
- Rundblad, G. & O. Knapton. (in preparation). Media communication on drinking water and safe behaviour: a comparison of the different stages of a natural disaster.
- Knapton, O. & G. Rundblad. (in preparation). The discourse of a drinking water emergency in UK media: a cognitive approach to discourse analysis.

Presentations

- 'Risk behaviour and compliance following 'boil water' notices due to a natural disaster versus a human error incident'. HPA conference, Warwick, 2009.
- 'Why risk behaviour and compliance during natural disasters differ significantly from human error events and what we can do about it'. American Public Health Association Conference, Philadelphia, 2009.
- 'Consumer perception, behaviour and compliance with public health advice on drinking water' (invited talk). CDC/AWWA, Atlanta, 2009.
- 'Media communication during a natural disaster'. Society for Risk Analysis Conference, London, 2010.
- 'Communicating safe behaviour to the general public: A comparison of the different stages of a natural disaster'. Communication Medicine and Ethics, Boston, 2010.
- 'Communication about drinking water safety: A cognitive discourse analysis approach'. UK Cognitive Linguistics Conference, Hertfordshire, 2010.
- 'Communication and compliance: a study of the 2007 natural disaster induced incident at Mythe'. KCL/DWI workshop, London, 2010.

Other Dissemination

- *Communication challenges faced by the UK water industry* - a knowledge transfer workshop, organised by project team and DWI, featuring talks from academics and communication professionals from UK water industry and wider stakeholders.
- www.PublicHealthCommunication.org.uk – project website featuring details of the team's current/past projects.

6. Future Research Plans

Rundblad is currently running a 24-month project, 'Consumer perceptions and attitudes towards EDCs and PPCPs in drinking water', funded by the US Water Research Foundation. The new project builds directly on the present one in terms of research design, methods (especially CogDA), and predicted results. Knapton is applying CogDA to mental health discourse (PhD funded by ESRC).

7. Key Words

Public Health Communication; Cognitive Linguistics; Consumer Compliance; Drinking water; Natural disaster