Scientific Evidence and the Media: Investigating the Journalistic Intention to Represent Scientific Uncertainty[1]

Lars Guenther[2]
Stellenbosch University, Stellenbosch, South Africa

Georg Ruhrmann
Friedrich Schiller University, Jena, Germany

Introduction

What science journalists have in common is the reporting on scientific research results; however, science journalists do not equally report on the *scientific evidence* of these results. Scientific evidence is one of the basic characteristics of scientific results, and scientific evidence falls somewhere on a continuum from scientific uncertainty to scientific certainty (Stocking & Holstein, 1993, 2009). What this continuum implies is that some research findings are perceived to be more certain than others. Scientific certainty is enhanced when hypotheses are confirmed, when findings are successfully replicated, or when researchers provide reliable and valid data; scientific uncertainty is caused by an absence of knowledge, stemming from scientific results that are tentative, not yet validated, contradictory, inconsistent, or not reproducible (Grade Working Group, 2004; Guenther, Froehlich & Ruhrmann, 2015; Popper, 1960; Zehr, 2000).

Although uncertainty is an integral part of science and the scientific community, there are some concerns as to whether journalists also recognize and emphasize this issue in their media reports. That is why this article asks to what extend science journalists intend to represent uncertainty and if they do, what factors influence them the most. This is a relevant question, because mass media are the main—and often, the only—source of scientific information for laypeople, influencing, among other things, their understanding and opinions of scientific research and uncertainty, and science-related behaviors (e.g., Cacciatore et al., 2012).

Scientific (Un)Certainty and the Media

When reporting on current research findings, journalists can represent the scientific evidence of research results with statements indicating scientific certainty and/or uncertainty (Corbett & Durfee, 2004). Most content analyses report an underrepresentation of scientific uncertainty in the media (Cacciatore et al., 2012; Dudo, Dunwoody, & Scheufele, 2011; Olausson, 2009). However, other researchers have reported over-representations (e.g., Zehr, 2000) or at least frequent mentioning of scientific uncertainty (Anderson, Allan, Petersen, & Wilkinson, 2005; Friedman & Egolf, 2011; Ruhrmann, Guenther, Kessler, & Milde, 2015). As a result, journalists are perceived to choose between different representational styles to report on scientific (un)certainty (Guenther, Froehlich & Ruhrmann, 2015).

[1] An extended and updated version of this paper was published in *Public Understanding of Science* (see Guenther & Ruhrmann, 2016).
[2] Corresponding author, email: larsguenther@sun.ac.za

Journalists' can either *downplay uncertainty*, attract public attention by *hyping uncertainty*, or they can, in a scientific sense, present scientific information *accurately*, i.e., depicting issues without highlighting or downplaying specific points of scientific certainty or uncertainty (Ashe, 2013; Ebeling, 2008; Schneider, 2010; Stocking & Holstein, 1993, 2009; Zehr, 2000).

The reasons why the representational styles of scientific evidence differ among science journalists have rarely been investigated. Dunwoody (1997) and Stocking (1997) identified three factors that, theoretically, might influence how journalists deal with scientific evidence: individual characteristics of the journalist, occupational characteristics, and cultural factors. Stocking and Holstein (2009) found that personal interests, perceptions of the audience, individual understanding of science, and journalistic roles were important factors in how journalists allowed uncertainty claims to enter into their media reports. However, despite these findings, this area still lacks a model to explain why only some journalists emphasize scientific uncertainty in their reports, while others do not.

Guenther, Froehlich and Ruhrmann (2015) developed a model trying to explain the journalistic representation of scientific (un)certainty. This model is an adaption of the *reasoned action approach* (RAA) (Fishbein & Ajzen, 2010), translated into the field of science communication. The RAA is a conceptual framework based on the idea that people develop intentions to perform a certain behavior (Ajzen, 2005), making intentions the most important determinants of whether or not someone will perform an action. Intentions have three determinants: attitude towards the behavior, subjective norms, and perceived behavioral control (Fishbein & Ajzen, 2010; see also Ajzen, 2006). Behavioral beliefs are beliefs about the likely consequences of a behavior, normative beliefs are beliefs about the normative expectations of others, and control beliefs are beliefs about the presence of factors that may facilitate or impede the performance of the behavior.

This model posits that a journalist's behavioral intention to represent the scientific uncertainty of research findings is the best predictor of this specific behavior. This intention is influenced by several predictors. According to the RAA, such predictors are attitudes towards representing uncertainty, subjective norms, and perceived behavioral control—and their beliefs, respectively (compare to Ajzen, 2006). Using data from preliminary qualitative interviews with German science journalists and focusing on nanotechnology-related coverage of scientific (un)certainty, Guenther, Froehlich and Ruhrmann (2015) listed items pertaining to behavioral beliefs, normative beliefs, and control beliefs. They have been used to answer the research question of this article: *To what extend do science journalists intend to represent uncertainty and if they do, what factors influence them the most?*

Method

To answer the research question, we started with creating a database listing names and contact details of a representative sample of German science journalists. Several approaches were used to achieve this. At the end, this database included 1249 science journalists. These journalists were e-mailed by the researchers and asked if they were interested in participating. The telephone numbers of those journalists who agreed to participate were submitted to Friedrich Schiller University's computer-assisted telephone interview laboratory.

Of the initial 1249 telephone numbers generated, 857 were excluded or deemed unsuitable for study participation. Journalists were only considered valid for study participation if their density of current science journalistic work exceeded 33%. Journalists also had to report on issues associated with the field of life sciences (e.g., biology, molecular science). Of the 392 contacts

made with journalists who fulfilled study criteria, 185 refused participation or declined to be interviewed. This yielded 207 completed interviews (5 served as pretest).

In the telephone interviews, the variables related to the RAA were collected individually. The defined behavior in this investigation is the representation of the scientific uncertainty of research in a future report. The intention to represent scientific uncertainty in a future report was set as the dependent variable. To measure this intention, as well as behavioral, normative, and control beliefs, expectancy-value models have been used (Ajzen, 2006; Fishbein & Ajzen, 2010). For more information, also on background factors and how items were analyzed, please read Guenther and Ruhrmann (2016).

Results

Most of the journalists interviewed in the present study intended to mention the uncertainty of research findings in a future report about life sciences (M = 7.24; SD = 3.04).

Results of regression analyses were able to explain 43% of variance (F = 9.325; df = 11; p < .001). The coverage of other media as a control belief (β = .340; t = 4.565; p < .001), individual perceptions regarding the scientific uncertainty of the main field of coverage (β = .305; t = 4.249; p < .001), expectations of the audience as an injunctive normative belief (β = .258; t = 2.808; p < .01), past behavior (β = .234; t = 3.099; p < .01), and gender (β = -.222; t = -3.037; p < .01) were all significant predictors of a journalist's intention to represent the scientific uncertainty of research in a future report. Hence, if the participating science journalists identified other media as representing uncertainty, if they perceived uncertainty in their main field of coverage, if they expected their audience to favor a representation of uncertainty, or if they showed a past behavior of depicting uncertainty, they were then more likely to intend to represent uncertainty in a future report. The intention to depict uncertainty was lower in females than in males.

Conclusion

The article was able to support the assertion that reporters' beliefs about audiences' expectations of coverage are important predictors in journalistic intentions to represent uncertainty (see also Dunwoody, 1997; Stocking, 1997; Stocking & Holstein, 2009). If journalists think that their readers, viewers, or listeners cannot deal with scientifically uncertain information, they may opt for a more scientifically certain representation of research results (see also Ebeling, 2008; Schneider, 2010). On the other hand, journalists who are interested in creating more upstream engagement with the public might see an inability to handle such uncertainty as an opportunity to better educate and engage the public; journalists applying this logic might therefore represent research findings as more scientifically uncertain.

The significant findings in the present study for both individual perceptions of the main field of coverage and past behavior clearly highlight the importance of the individual in the process of explaining why science is reported the way it is. The findings of the present paper also highlight the importance of reporters' beliefs about the coverage of other media, which seemed to guide science journalists in their representation of issues. Finally, there is not yet an explanation for the gender difference.

The investigation presented in this article has a number of limitations (see Guenther & Ruhrmann, 2016). And in light of these limitations, there is only certainty about uncertainty.

References

Ajzen, I. (2006). *Constructing a TPB questionnaire: Conceptual and methodological considerations.* Retrieved from: http.//people.umass.edu/aizen/pdf/tpb.measurement.pdf

Anderson, A., Allan, S., Petersen, A., & Wilkinson, C. (2005). The framing of nanotechnologies in the British newspaper press. *Science Communication, 27*, 200–220.

Ashe, T. (2013). *How the media report scientific risk and uncertainty: A review of the literature.* Oxford, England: Reuters Institute for the Study of Journalism.

Cacciatore, M., Anderson, A. A., Choi, D. H., Brossard, D., Scheufele, D. A., Liang, X., Ladwig, P., Xenos, M. A., & Dudo, A. (2012). Coverage of emerging technologies: A comparison between print and online media. *New Media & Society, 14*, 1039–1059.

Corbett, J. B., & Durfee, J. L. (2004). Testing public (un)certainty of science: Media representations of global warming. *Science Communication, 26*, 129–151.

Dudo, A., Dunwoody, S., & Scheufele, D. A. (2011). The emergence of nano news: Tracking thematic trends and changes in U.S. newspaper coverage of nanotechnology. *Journalism & Mass Communication Quarterly, 88*, 55–75.

Dunwoody, S. (1997). What's a journalist to do? Challenges and approaches to reporting scientific assessment, In S. J. Hassol & J. Katzenberger (Eds.), *Characterizing and communicating scientific uncertainty* (pp. 46–49). Aspen, CO: Aspen Global Climate Change Institute.

Ebeling, M. F. (2008). Mediating uncertainty: Communicating the financial risks of nanotechnologies. *Science Communication, 29*, 335–361.

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach.* New York, NY: Psychology Press.

Guenther, L., Froehlich, K., & Ruhrmann, G. (2015). (Un)Certainty in the news: Journalists' decisions on communicating the scientific evidence of nanotechnology. *Journalism and Mass Communication Quarterly, 92*(1), 199–220.

Guenther, L., & Ruhrmann, G. (2016). Scientific evidence and mass media: Investigating the journalistic intention to represent scientific uncertainty. *Public Understanding of Science* (online before print). doi: 10.1177/0963662515625479.

Grade Working Group (2004). Grading quality of evidence and strength of recommendations. *British Medical Journal, 328*, 1490–1494.

Olausson, U. (2009). Global warming – global responsibility? Media frames of collective action and scientific certainty. *Public Understanding of Science, 18*, 421–436.

Popper, K. (1960). *The logic of scientific discovery.* London: Hutchinson & Co.

Ruhrmann, G., Guenther, L., Kessler, S.H., & Milde, J. (2015). Frames of scientific evidence: How journalists represent the (un)certainty of molecular medicine in science television programs. *Public Understanding of Science, 24*(6), 681–696.

Schneider, J. (2010). Making space for the "'nuances of truth": Communication and uncertainty at an environmental journalists' workshop. *Science Communication, 32*, 171–201.

Stocking, S. H. (1997). How journalists deal with scientific uncertainty. In S. J. Hassol & J. Katzenberger (Eds.), *Characterizing and communicating scientific uncertainty* (pp. 109–112). Aspen, CO: Aspen Global Climate Change Institute.

Stocking, S. H., & Holstein, L. W. (1993). Constructing and reconstructing scientific ignorance: Ignorance claims in science and journalism. *Science Communication, 15*, 186–210.

Stocking, S. H., & Holstein, L. W. (2009). Manufacturing doubt: Journalists' roles and the construction of ignorance in a scientific controversy. *Public Understanding of Science, 18*, 23–42.

Zehr, S. C. (2000). Public representation of scientific uncertainty about global climate change. *Public Understanding of Science, 9*, 85–103.