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Abstract

Surveys suggest that approximately one third of news consumers have encountered conflicting reports of the same information. News coverage of science is especially prone to conflict, but how news consumers perceive this situation is currently unknown. College students ($N = 242$) participated in a lab experiment where they were exposed to news coverage about one of two scientific controversies in the United States: dioxin in sewage sludge or the reintroduction of gray wolves to populated areas. Participants received (a) one news article (control), (b) two news articles that were consistent (convergent), or (c) two news articles that conflicted (divergent). The effects of divergence induced uncertainty differed by news story. Greater uncertainty was associated with increased scientists' credibility ratings for those reading dioxin regulation articles and decreased scientists' credibility ratings for those reading wolf reintroduction articles. Unlike other manifestations of uncertainty in scientific discourse, conflicting stories seem to generate effects that vary significantly by topic. Consistent with uncertainty management theory, uncertainty is embraced or rejected by situation.

Keywords

cancer communications, health and media, interaction experts/publics, media and science, public understanding of science, representations of science, science attitudes and perceptions

1. Introduction

Media coverage is often inconsistent. This should come as no surprise given the large number of media outlets operating in the world and the diversity of topics under discussion at any given moment.

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Indeed, in a national survey of 1,600 U.S. adults, Roper (1985) found that half the sample had encountered conflicting reports in the media. Of those, one third said that the conflict had occurred within the same medium; for example, two newspapers had offered conflicting reports of an issue.

Researchers have found that conflicting coverage is common, especially for certain genres of news. Notably, news stories about science are often inconsistent (Friedman, 1999; Rall, 1994; Russell, 1999). For example, Friedman found that news coverage of dioxin, a suspected carcinogenic byproduct found in many industrialized areas, was highly inconsistent over a period of years. The highly inconsistent, event-driven nature of the coverage led her to call dioxin a “never-ending story” that said more about the news industry than the chemical itself (1999: 113).

One reason media coverage of science is often inconsistent is that a significant portion of stories focus on creating controversy or conflict (Stocking, 1999; Stocking and Holstein, 2009), especially those produced by larger news organizations serving national audiences (Wallington et al., 2010). A typical scientific controversy pits multiple factions—usually an interest group, a commercial entity, and a government agency—against one another in a battle to control framing of the issue (e.g., Brossard, 2009; Liebler and Bendix, 1996). Previous research has also shown that news stories about scientific debates tend to favor one-sided portrayals of the issue instead of more balanced stories reflecting the needs and concerns of all sides (Fico and Soffin, 1995; Friedman et al., 1996). Considered jointly, the desire of interest groups to position their issue favorably and the tendency of news outlets to rely on only a single angle create a situation where conflicting coverage is a distinct possibility. For instance, two newspapers might depict the same issue according to the desired frames of two opposing interest groups leading to drastically different stories.

That media coverage of science can be conflicted is evident; however, the effect this inconsistency has on receivers is currently unknown. Conflict within or across media is a manifestation of uncertainty (Dunwoody, 1999) as well as a routine media interaction (Chaffee, 1986). A growing body of research has examined how various manifestations of uncertainty in science news coverage are processed by audiences, such as context free stories (Corbett and Durfee, 2004) or the presence or absence of hedging (Jensen, 2008; Jensen et al., in press). From a theoretical standpoint, uncertainty management theory postulates that uncertainty is a state of being that people seek to reduce or embrace based on individual needs and (often subtle) environmental cues (Brashers, 2001). Therefore, identifying and testing uncertainty-inducing message features is crucial as uncertainty is a complex cognition that can trigger or reduce both positive states (e.g., increased source credibility; see Jensen, 2008) and negative states (e.g., cancer fatalism; see Jensen et al., in press). Thus, the purpose of the present study is to examine how receivers react to news stories that present an issue similarly (convergent coverage) or differently (divergent coverage).

Processing uncertainty

Context aside, the present study, in a larger sense, increases our understanding of how people process uncertainty. Berger and Calabrese (1975) were among the first communication scholars to recognize the importance of uncertainty in communication. They observed that many activities common in initial interactions involved the reduction of uncertainty. This observation led to the creation of a theoretical framework that has been called initial interaction theory, uncertainty theory, and, most commonly, uncertainty reduction theory (URT).

URT posits that human beings “seek to reduce their uncertainties about their environment so that they can respond ... in ways that will assure goal achievement” (Berger, 1987: 41). In other words, URT starts from the premise that uncertainty is a problematic cognitive state that information processors seek to alleviate to better achieve their situational goals. For example, Joe might go to a dermatologist to have a mole checked in order to reduce uncertainty about the mole. Joe’s

decision to have his mole checked is driven by a desire to react properly to the situation (e.g., if it is cancerous, Joe can seek treatment). Thus, uncertainty reduction is a tactical response to an affective state grounded in the belief that increased certainty allows for greater environmental control.

If uncertainty is a dissonant state that human beings want to reduce, then a natural question is, "How do lay people reduce uncertainty?" URT asserts that human beings have considerable prior knowledge that aids in deciphering situations clouded in uncertainty (Berger, 1987). Therefore, prior knowledge is the first tool used to combat uncertainty. When prior knowledge is insufficient to adequately reduce uncertainty, then a natural reaction is information seeking or information acquisition. Research on information seeking has identified several different strategies people use to acquire information, ranging from unobtrusive observation to face-to-face contact with another person (e.g., Berger, 1979). Early work on information seeking suggested that human beings are very capable at acquiring and interpreting data to reduce uncertainty (Hews et al., 1985).

URT has produced an intriguing line of research, but the most recent development in the study of uncertainty is a body of research focused on the management of uncertainty (e.g., Brashers, 2001). Uncertainty management theory starts from the premise that uncertainty is not always a dissonant state.

Although people quite often do want to reduce complexity and ambiguity in their lives, perhaps as a prerequisite to decision making, planning, or predicting the behavior of others, there are other times when uncertainty allows people to maintain hope and optimism or when tasks can be performed despite, or because of, uncertainty. (Brashers, 2001: 478)

In other words, uncertainty management research complicates the idea of uncertainty and reframes uncertainty reduction as just one type of response available to information processors.

The idea that uncertainty can be a positive affective state is somewhat reminiscent of risk perception research focused on desired risk (e.g., Machlis and Rosa, 1990). The similar premise behind both ideas is that uncertainty/risk is not always an undesirable thing. Indeed, sometimes people seek out uncertainty (e.g., people living with a terminal illness looking for hope) or risk (e.g., bungee jumping) for personally beneficial reasons.

The present study seeks to further our knowledge of how people process uncertainty by examining lay reactions to increased scientific uncertainty. Research on uncertainty management suggests that people actively manage uncertainty in ways that support their interests (Brashers, 2001). One way people manage their uncertainty is by reducing it (as URT posits); however, uncertainty reduction is not the only reaction available. At present, more research is needed to identify situations where people react to uncertainty alternatively (i.e., situations where uncertainty is a desirable state). A better understanding of when and how people react to uncertainty will increase the predictive power of research on uncertainty management.

Uncertainty and news coverage of science

Uncertainty is central to science and pervades almost all scientific activities. Popper (1961) argued that the scientific community distinguished itself by embracing the limitations of existing knowledge, a philosophy that is generally accepted as the dominant paradigm of modern scientific inquiry. Though scientists often try to thread uncertainty into their discourse (e.g., a limitations section), it has been observed that this information is systematically removed as scientific discovery is prepared for public consumption (e.g., Nelkin, 1995; Star, 1983; Stocking, 1999). Specifically, news coverage of science often omits caveats and limitations (stated in the original research report) because this material has been streamlined; initially by scientists and then by public relations professionals and journalists (Brechman, Lee and Cappella, 2009; Pellechia, 1997; Tankard and Ryan,

1974). For example, Lai and Lane (2009) found that 43% of front page newspaper stories about science were based on preliminary evidence. Of those stories, only 18% were described as preliminary or mentioned limitations of the research.

But uncertainty has a way of making it back into scientific discourse. As one type of uncertainty is removed (e.g., scientists' self-disclosure of research limitations) it is routinely replaced by another. Tuchman (1972) noted that news norms favor balanced coverage; a goal that produces conflicting voices within news stories. For example, in news coverage of science, it is common practice for journalists to include experts representing all sides of an issue (Dearing, 1995; Dunwoody, 1999).

Science news coverage is often constructed in one of four ways: (a) single news stories where scientists question their own research (i.e., disclosure), (b) single news stories that offer multiple perspectives (i.e., dueling), (c) multiple news stories that are all framed in favor of one side (i.e., slanted), or (d) multiple news stories that are each framed in favor of one side or the other (i.e., conflicted). All four forms of coverage can be driven by balance norms, financial interests, and source selection (Dunwoody, 1999; Stocking, 1999; Tuchman, 1972). The structure of news coverage can also derive from variation in community power structure. Communities with centralized power tend to have media entities that support the status quo whereas those with decentralized power have media entities that are more likely to embrace conflict (Tichenor, Donohue and Olien, 1980; Wallington et al., 2010). Thus, populations at the intersection of two communities with different power structures (e.g., suburban populations) could routinely encounter news coverage that conflicts.

To date, experimental work has focused primarily on news consumer reaction to dueling or disclosure stories. Corbett and Durfee (2004) conducted an experiment where they manipulated dueling and context in a single news story about global warming. Dueling was manipulated by inserting an outside expert into the story who pointed out limitations in the research. Context, on the other hand, was manipulated by including a paragraph that described the larger research trends relevant to the article. They found that additional context increased readers' perceptions of the certainty of global warming whereas the presence of dueling experts had the opposite effect.

Jensen (2008) examined how variations of dueling coverage impacted news consumer perceptions of scientists' and journalists' credibility. In a lab experiment using news coverage of cancer research as stimuli, he attributed uncertainty to either the scientists responsible for the research (i.e., the disclosure condition) or scientists unaffiliated with the research (i.e., the dueling condition). Participants exposed to the disclosure condition were found to rate scientists and journalists as more trustworthy. A follow-up study, using the same stimuli, revealed that increased uncertainty reduced fatalistic beliefs about cancer and negative backlash against nutritional recommendations. Moreover, participants exposed to dueling coverage had significantly greater trust in medical professions, a finding that suggests news consumers make meaningful distinctions between scientists and those involved in healthcare (Jensen et al., in press).

Taken together, all three studies suggest that variations in uncertainty in dueling stories can have significant impact on news consumer perceptions. However, both studies only examined audience reaction to a single news story. Thus, none of the studies considered how news consumers processed uncertainty created by multiple stories that are slanted or conflicted. Gantz (1981) considered a similar question, but focused on the believability of various media (e.g., television, newspapers) when there were multiple conflicting reports. He found that people tended to trust television stories more than newspaper stories in the event of a conflict between the two. The present study extends this work by examining whether conflicting reports via the same channel or medium (e.g., newspapers) influence public perception of the issue.

Channel interactions: Convergent and divergent news coverage

Roper initially asked survey respondents about conflicting media coverage in 1939, but Chaffee was the first scholar to theorize how it might impact audience perception. In his seminal article on channel interactions, Chaffee (1986) articulated a framework describing how communication channels can conflict and complement one another. His primary goal was to encourage researchers to evolve beyond traditional interpersonal versus mass communication channel competition research designs (e.g., are people more influenced by health information they hear from friends or the television?), but he also provided a basic template for theorizing about all channel interactions (within and across communication types).

For his part, Chaffee (1986) identified three possible communication channel interactions: convergence, divergence, and complementary. Convergence, when different channels provide the same or overlapping messages, was viewed by Chaffee as the most common form of interaction between channels. Divergence, when different channels provide contradictory information, was viewed by Chaffee as exceedingly rare. However, since conflicted media coverage is an example of divergence and surveys have shown that many people have experienced conflicted coverage, Chaffee's perception of frequency may have been inaccurate. In truth, the actual ratio at which people experience convergent and divergent narratives is currently unknown, but it is likely that convergence is more common than divergence overall. A third interaction, complementary, occurs when information is carried in one channel but not another. The idea behind complementary interaction is that channels can supplement one another by providing information unavailable in other channels.

Not only did Chaffee (1986) outline possible interactions between channels, but he also theorized about the effect two interactions, convergence and divergence, would have on receivers. Chaffee believed that convergence served to strengthen a receiver's confidence in a message, while divergence called the validity of a message into question. Chaffee's predictions were tentative, by his own admission, in light of a limited body of literature exploring media effects under conditions of convergence and divergence.

Though not a channel interaction study, Corbett and Durfee's (2004) findings mirror Chaffee's (1986) original predictions: Individuals exposed to dueling coverage were more uncertain about the information. The present study extends this work by examining the impact of divergence across channels (i.e., conflicted coverage). Based on Chaffee's channel interaction postulates, we hypothesize that divergent coverage will be perceived as less coherent and will be more likely to increase participant uncertainty.

- H1: Individuals exposed to divergent news coverage of scientific controversies will perceive the coverage as less coherent.
- H2: Individuals exposed to divergent news coverage of scientific controversies will express greater uncertainty about the issue.

Chaffee did not theorize about the impact of divergence on credibility perceptions, but it is tempting to think that conflict will reflect negatively on those involved in the situation. Indeed, early sociological research on science communication assumed that uncertainty diminished the authority of scientists (Zehr, 1999). Directly contradicting this idea, Jensen (2008) found that manipulation of another type of uncertainty (disclosure) positively affected scientists' credibility. This finding is consistent with the idea that the scientific community distinguishes and ultimately sustains itself by embracing uncertainty (Popper, 1961). Thus, the actual relationship between divergence and the perceived credibility of scientists is unclear. One possibility is that this relationship could hinge on perceptions

about the coherence and uncertainty of the coverage. That is, perceived coherence and uncertainty could moderate the relationship between divergent coverage and the perceived credibility of scientists. Given the diverse range of possible findings, the following research questions are posed:

- RQ1: Does divergent news coverage of scientific controversies impact reader perception of scientists' credibility?
- RQ2: Does perceived coherence moderate the relationship between divergent news coverage of scientific controversies and reader perception of scientists' credibility?
- RQ3: Does perceived uncertainty moderate the relationship between divergent news coverage of scientific controversies and reader perception of scientists' credibility?

2. Method

Design

The experiment followed a $2 \times 3 \times 2$ full factorial design: two news topics (dioxin regulation and wolf reintroduction), three channel conditions (a single one-sided article and a filler article, two one-sided convergent articles, and two one-sided divergent articles), and reversal of article order (e.g., receiving either the single one-sided article and then the filler or the filler and then the single one-sided article). The purpose of the first channel condition (i.e., a single one-sided article and a filler article or a filler article and a single one-sided article) was to serve as a control group for the convergent condition. If this had not been done, we would have been unable to distinguish between effects caused by convergence and effects caused by one-sided articles. No differences were found by reversal of article order, so the data were collapsed to ease analysis.

Participants

Students enrolled in an introductory communication course at a large university in the United States were offered extra credit by their instructor to participate in this study. A total of 242 students voluntarily completed the study (no student refused to participate). Slightly more females (56%) participated than males. Compared to the U.S. population as a whole, the sample was relatively diverse: 66.3% were Caucasian, 11.1% were African American, 9.9% were Asian, 5.8% were Hispanic, and 7.9% described themselves as "other" (participants could select more than one option). The mean age of the sample was 18.3 ($SD = 0.6$).

Procedure

At the start of a class period, both researchers entered the classroom and waited for the instructor to introduce them. Following a brief introduction, the researchers told participants they could voluntarily participate in a study in which they would be reading newspaper articles and filling out a survey. The study was described as a news study both in the introduction and on the consent form. Participants were given a consent form to read and sign. Once consent forms were collected, the experiment began. Participants were given a packet containing a pre-test, two newspaper articles, and a post-test. Each packet contained newspaper articles about one of the two topics. Packets were randomly distributed across class section and individual participant. As the packets were handed out, participants were asked not to review previous pages. Once all participants were finished, surveys were collected, and the participants were debriefed.

Stimulus materials

Participants received reproductions of actual U.S. newspaper articles. To avoid confounds related to paper of origin (e.g., *Chicago Sun Times*, *New York Times*, etc.), only the headline and body of the articles were shown to participants. On a page immediately preceding the articles, participants were informed that all articles had appeared in major U.S. newspapers in the previous year.

To ensure that stimulus materials actually represented the manipulation of interest (i.e., conflicted media coverage), all articles were informally coded by one of the authors. To aid in coding, the authors used an adaptation of Fico and Soffin's (1995) coding scheme for assessing fairness and balance of newspaper coverage of controversial issues. For each topic area, two con stories and one pro story were identified to allow for the creation of convergent/divergent conditions (all stimuli can be found at <http://web.ics.purdue.edu/~j djensen/>).

News coverage of science is often conflicted (Friedman, 1999); therefore, two public scientific controversies (dioxin regulation and wolf reintroduction) were selected for the current study. Both issues have received sustained news coverage for well over a decade, providing ample time for conflicting coverage to emerge.

Dioxin regulation. Cancer is a common topic covered by national, local, and even ethnic news organizations (Cohen et al., 2008; Jensen et al., 2010; Slater et al., 2008; Zheng and Gantz, 2010). The chemical dioxin has been a topic of discussion in the media for several decades (Friedman, 1999). Dioxin, a possible carcinogen, once again caught the attention of U.S. media following the Environmental Protection Agency's decision not to regulate it in sewer sludge used as fertilizer by farmers across the United States. This decision immediately drew criticism from most environmentalists and praise from most farmers involved with sewer sludge management.

As a result, media coverage of dioxin regulation was highly conflicted. Some stories framed the Environmental Protection Agency's decision as logical, while others sided with the concerns of environmentalists. The logic, evidence, and harms of not regulating dioxin varied from newspaper to newspaper and story to story.

Wolf reintroduction. Environmental news coverage is not as common as cancer news coverage, but it is often framed around controversy (e.g., Liebler and Bendix, 1996). The reintroduction of the gray wolf is one environmental issue that has had enduring media coverage. Extinct in many regions for decades, the reintroduction of the gray wolf to the northwestern United States in 1995–96 was met with criticism from ranchers and praise from many conservationists. Wolf reintroduction caught the attention of the media again when the U.S. Department of Fish, Wildlife, and Parks announced the gray wolf would soon be taken off the endangered species list. This decision, seemingly harmless, forced all states with a wolf population, primarily states in the American northwest, to create their own wolf management plans. Previously a federal issue, returning control to the states rekindled the wolf reintroduction debate resulting in another heated conflict.

Not surprisingly, U.S. media coverage of wolf reintroduction was highly conflicted. Some stories framed the reintroduction of the gray wolf as a politicized endeavor with numerous negative externalities for farmers and ranchers, while others depicted the effort as an important ecological move benefiting the region and barely affecting area residents. The logic, evidence, and harms of reintroducing wolves to the northwest also varied significantly within and across media.

Measures

Political ideology. Participants were asked about their political ideology. Response options (and participant responses) were *conservative* (28%), *liberal* (34.2%), *other* (6.2%), and *I don't know* (31.7%).

Prior knowledge. After reading the news articles, participants were asked, "Prior to this study, had you heard about (dioxin regulation/wolf reintroduction)?" Response options included *no, it sounded familiar*, and *yes* ($M = .48, SD = .71$). More participants had prior knowledge about wolf reintroduction (17.4%) than dioxin regulation (9.0%), $\gamma = 0.24, p = .04$.

Perceived coherence. Participants were asked, "How would you describe the articles concerning dioxin regulation?" Response options (*clear/not clear, coherent/not coherent, helpful/not helpful*) were assessed using three seven-point scales. The three items were combined into a single perceived coherence scale ($M = 3.30, SD = 1.07$; Cronbach's $\alpha = .80$).

Perceived uncertainty. Participants were asked, "How do you feel about dioxin regulation?" and provided with a seven-point perceived certainty scale (*certain/uncertain*) ($M = 4.00, SD = 1.24$).

Scientists' perceived credibility. Participants were asked, "How do you feel about scientists or science experts?" Participants responded using seven-point scales measuring competence (*competent/incompetent*), trustworthiness (*trustworthy/untrustworthy*), and concern about public interest (*protect public interest/don't protect public interest*). The three items were combined into a single index ($M = 5.21, SD = .86$; Cronbach's $\alpha = .84$). Perceived credibility was a repeated measure (i.e., assessed in both the pre-test and the post-test).

3. Results

H1: Perceived coherence

H1 postulated that participants exposed to divergence would perceive the coverage as less coherent. To test this hypothesis a two-way ANOVA was carried out with perceived coherence as the dependent variable and channel and news story as fixed factors. There was no significant main effect for channel, $F(2, 236) = .71, p = .49$, a marginally significant main effect for news story, $F(1, 236) = 3.73, p = .05$, partial $\eta^2 = .01$, and a significant channel \times news story interaction, $F(2, 236) = 3.46, p = .03$, partial $\eta^2 = .02$. Bonferroni post hoc tests indicated that participants viewed the dioxin regulation stories as marginally more coherent ($M = 3.43, SE = .09$) than the wolf reintroduction stories ($M = 3.17, SE = .09$). An examination of the significant channel \times news story interaction revealed that divergent coverage of wolf reintroduction was viewed as the least coherent (see Table 1).

Table 1. Perceived coherence by channel and news story.

Condition	Control Mean (SE)	Convergent Mean (SE)	Divergent Mean (SE)
Dioxin regulation	3.53 (.16) ^b	3.20 (.16) ^{a,b}	3.57 (.16) ^b
Wolf reintroduction	3.29 (.16) ^{a,b}	3.37 (.16) ^{a,b}	2.85 (.16) ^a
<i>n</i>	83	80	79

Note: Higher scores indicate greater coherence. Means that do not share common subscripts are significantly different, $p < .05$.

Table 2. Perceived uncertainty by channel and news story.

Condition	Control Mean (SE)	Convergent Mean (SE)	Divergent Mean (SE)
Dioxin regulation	3.66 (.18) ^a	4.20 (.18) ^{a,b}	4.58 (.18) ^b
Wolf reintroduction	3.95 (.18) ^{a,b}	4.22 (.18) ^{a,b}	3.35 (.19) ^a
<i>n</i>	83	80	79

Note: Higher scores indicate greater uncertainty. Means that do not share common subscripts are significantly different, $p < .05$.

H2: Perceived uncertainty

H2 postulated that participants exposed to divergent news coverage would express greater feelings of uncertainty. A two-way ANOVA revealed a marginally significant main effect for channel, $F(2, 236) = 2.35, p = .09$, partial $\eta^2 = .02$, and significant effects for news story, $F(1, 236) = 3.99, p = .04$, partial $\eta^2 = .01$, and the channel \times news story interaction, $F(2, 236) = 9.23, p < .001$, partial $\eta^2 = .07$. Bonferroni post hoc tests indicated that participants felt more uncertain following exposure to the dioxin regulation stories ($M = 4.15, SE = .10$) compared to the wolf reintroduction stories ($M = 3.84, SE = .10$) ($p < .05$). An examination of the channel \times news story interaction revealed that participants in the divergent condition felt more uncertainty when exposed to the dioxin regulation articles and less uncertainty when exposed to the wolf reintroduction articles (see Table 2).

RQ1–RQ3: Scientists' perceived credibility

RQ1 asked whether divergent coverage altered news consumers' credibility perceptions of scientists. To examine this issue, a three-way, repeated measures ANOVA was carried out, with change in scientists' credibility ratings as a dependent variable and channel and news story as fixed factors. Repeated measures ANOVAs enable statisticians to examine the variance between subjects (e.g., compare change in perceived credibility ratings across conditions) as well as the variance within subjects (e.g., compare change in individual perceived credibility ratings from pre-test to post-test). Of interest in this study was the change within subjects, as it could be influenced by the stimuli.

Across all conditions, scientists' perceived credibility changed significantly from time 1 to time 2, $F(1, 234) = 4.71, p < .03$, partial $\eta^2 = .02$, but credibility ratings did not significantly differ by channel, $F(2, 234) = 0.83, p = .43$, news story, $F(1, 234) = 2.68, p = .10$, or the channel \times news story interaction, $F(2, 234) = 0.02, p = .97$. Bonferroni post hoc tests revealed that scientists' credibility ratings dropped slightly from pre-test ($M = 5.27, SE = .06$) to post-test ($M = 5.15, SE = .06$).

RQ2 and RQ3 asked whether perceived coherence or uncertainty moderated the relationship between divergent news coverage and scientists' perceived credibility. Two four-way, repeated measures ANOVAs were carried out with either perceived coherence or uncertainty variables added to the analysis strategy described for RQ1. For this analysis, coherence and uncertainty were dichotomized (using 50% cutoff points to distinguish high and low scores).

Perceived coherence was not significantly related to scientists' perceived credibility, $F(1, 199) = 0.21, p = .64$, nor did it moderate the effects of credibility \times channel, $F(2, 199) = 1.28, p = .28$,

credibility \times news story, $F(1, 234) = 2.16, p = .14$, or credibility \times channel \times news story, $F(2, 234) = 2.02, p = .13$. Perceived uncertainty was marginally related to scientists' perceived credibility, $F(1, 227) = 3.38, p = .06$, partial $\eta^2 = .01$, and it significantly moderated the relationship for credibility \times news story, $F(1, 227) = 5.91, p = .01$, partial $\eta^2 = .02$, and credibility \times channel \times news story, $F(2, 227) = 4.67, p = .01$, partial $\eta^2 = .04$. It did not moderate the relationship between credibility \times channel, $F(2, 227) = 0.45, p = .63$. To help interpret the credibility \times channel \times news story interaction, difference scores were calculated (subtracting pre-test credibility ratings from post-test credibility ratings). Bonferroni post hoc tests revealed that the effects of divergence induced uncertainty differed by news story (see Figure 1). For those exposed to news stories about dioxin regulation, greater uncertainty was associated with increased scientists' credibility ratings (low uncertainty: $M = -.37, SE = .17$; high uncertainty: $M = .15, SE = .18$). Whereas, for those exposed to news stories about wolf reintroduction, greater uncertainty was associated with decreased scientists' credibility ratings (low uncertainty: $M = .24, SE = .14$; high uncertainty: $M = -.78, SE = .29$).

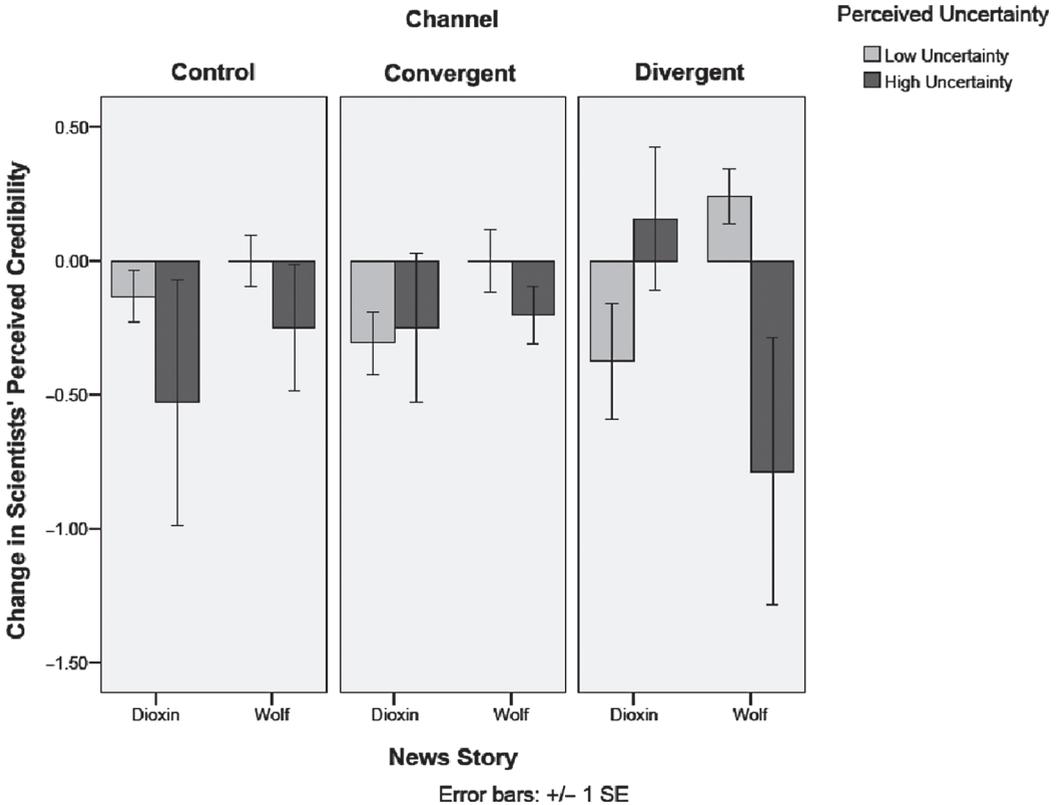


Figure 1. Change in scientists' perceived credibility by channel, news story, and perceived uncertainty. Negative scientists' perceived credibility scores reflect a decrease in perceived credibility following exposure to the news articles.

4. Discussion

Participants exposed to divergent news coverage about wolf reintroduction deemed the coverage less coherent, yet expressed more certainty about their beliefs. For dioxin regulation, the opposite relationship materialized: less coherent, more uncertain. Similarly, the effects of divergence induced uncertainty on scientists' perceived credibility varied by news story.

In a larger sense, the findings are consistent with the basic tenet of uncertainty management theory: People actively manage uncertainty in ways that support their interests (Brashers, 2001). For wolf reintroduction, feelings of uncertainty seemed to negatively impact participant perception. This suggests that uncertainty can generate negative affect (Berger, 1987). But those feeling more uncertain following exposure to dioxin regulation articles viewed scientists' as more credible (suggesting that uncertainty can generate positive affect; Brashers, 2001).

One possible explanation for the observed pattern of results is that people may have been less familiar with the topic of wolf reintroduction. URT posits that prior knowledge can influence how people approach uncertainty, where inadequate knowledge of the issue initiates uncertainty reduction (Berger, 1979). Extending this idea, it is possible that prior knowledge influenced how participants responded to feelings of uncertainty (or even what types of uncertainty they felt). Consistent with this explanation, prior knowledge did differ by news topic (greater prior knowledge for wolf reintroduction). Thus, as a follow-up, prior knowledge was included as a covariate in the credibility analyses described previously (i.e., RQ1–RQ3). The inclusion of prior knowledge did not alter the results.

Another plausible explanation for difference by topic is that political ideology shaped participant perception. Both news issues had underlying political tensions, thus it stands to reason that ideology might have influenced response. Again, as a follow-up, political ideology was included as a covariate; however, inconsistent with this explanation, it did not change the results.

A third explanation is that participants in the dioxin regulation condition may have been more likely to equate uncertainty with control. Past research has suggested that if people view powerless language as a demonstration of control, then it positively (rather than negatively) impacts scientists' perceived credibility (Burrell and Koper, 1998; Hosman and Siltanen, 2006; Jensen, 2008). Consistent with this idea is the finding that divergent news coverage of wolf reintroduction was viewed as the least coherent. If perceived coherence is an indicator of perceived control (which is debatable), then the negative reaction to uncertainty in the wolf reintroduction stories may be a reflection of lack of control. Future research should continue to investigate this explanation; a good starting point would be the development of a psychometrically sound measure of perceived control.

Perceived uncertainty results aside, one consistent finding is the location of the effect. Divergent coverage seemed to be the key catalyst of all effects, a pattern that suggests Chaffee (1986) was correct to redirect research attention toward channel interaction (rather than channel competition). Research on channel interactions will benefit from continued exploration of Chaffee's postulates, including predicted associations between divergence and information seeking. He asserted that receivers in divergent situations would become information seekers to reduce uncertainty created by the dubious validity of conflicting messages. According to Chaffee, "When ... channels present divergent ... information, the most likely result is that the person will seek further information from other channels" (p. 76). This postulate runs parallel to research on information seeking and scanning (Kahlor and Rosenthal, 2009; Niederdeppe, Frosch and Hornik, 2008; Niederdeppe et al., 2007) as well as current research on uncertainty management (Brashers, Goldsmith and Hsieh, 2002; Rosen and Knäuper, 2009). Of course, researchers should be mindful

of the possibility that news consumers may be prone to inaction following exposure to conflicting messages, perhaps because they think that other people will act in their stead (Jensen and Hurley, 2005).

Somewhat disconcertingly, participants in all conditions were less trusting of scientists following exposure. This is potentially problematic, as the public learns about science primarily via the media (National Science Board, 2010) and the stimuli in this project are typical of news stories about public scientific controversies (Friedman, 1999; Liebler and Bendix, 1996). That news coverage of this type elicits negative reactance is a possibility that science communication researchers should explore. It suggests that something about news coverage of science in general might provoke or prime distrust of scientists. This is consistent with Mazur's (1981) hypothesis which states that increased media coverage of scientific controversies can have negative impact on public attitudes towards and perceptions of technology (and perhaps science in general). Mazur argued that this pattern was readily observable: "The rise in reaction against a scientific technology appears to coincide with a rise in the quantity of media coverage, suggesting that media attention tends to elicit a conservative public bias" (p. 106). The hypothesis has received mixed support (see Gutteling, 2005), but even this is somewhat consistent with Mazur's original ideas as he noted that scientific controversies could produce "profound effects on public attitudes" that could be "difficult to specify" without further study (p. 109).

In line with this idea, Jensen (2008) noted that one of the complexities surrounding science communication is that researchers know very little about how the public views (or wants to view) science. Researchers should not assume that the public views scientists accurately or fairly; especially in light of the fact that over 80% of the American public lacks basic scientific literacy (Miller, 2004). Research investigating how the public views scientists, journalists, and the interaction of the two could take many forms; for example, researchers could examine whether the credibility of scientists varies following exposure to articles written by professional journalists as compared to science bloggers (as this may reveal underlying public attitudes about science journalists). Investigations of the impact of different sources (e.g., pharmaceutical companies, universities, government officials) commonly included in news coverage of science and health would help to clarify public perception as well (see, e.g., Moriarty, Jensen and Stryker, 2010).

More immediately, based on these findings, researchers should consider measuring perceived credibility both before and after exposure to media stimuli. The utility of repeated measures designs is that they allow researchers to observe how phenomena change (or don't change) over time. Subtle variations in story features can have meaningful effects on audiences, but it is possible that additional (and perhaps larger) effects are caused by raw exposure alone. For instance, using multi-level modeling, Hwang and Southwell (2009) found that population level exposure to television programming about science was positively related to feelings of scientific accessibility. A similar study could be conducted with scientific credibility as the outcome measure.

Credibility drop aside, the present study continues to advance understanding of news reporting of science. Journalists are critical of current reporting practices, and many are engaged in working to better understand science and uncertainty (Schneider, 2010). Researchers are also engaging this topic, as well as considering how to address balance norms in science (Clarke, 2008), news structure (Yaros, 2006), and scientific hyperbole (Ebeling, 2008). Understanding how news consumers perceive conflicting stories and what journalists can do to manage the situation is the long term goal of this research program.

Limitations

There are a number of limitations that should be pointed out. First, the observed effects were not consistent across news stories. Given this difference, researchers will want to replicate the basic design of this study using news coverage of other issues to see if the patterns observed here uphold. Second, the manipulation of convergence and divergence did not exhaust all possible story combinations. For example, both issues were represented by a combination of two con stories and one pro story (as this seemed to reflect actual news coverage patterns for the issues) but there was no condition with two pro stories and one con story. Such a condition may have yielded different results or revealed an alternative explanation for the data. Third, several constructs were assessed using single-item measures (e.g., perceived uncertainty); replication with more established multi-item measures would be ideal. Finally, the study was carried out with college students, a population that may not be representative of the public as a whole. Past research has found that college students are a suitable proxy for studying bias and expertise in the media (Slater and Rouner, 1996), but it is possible that educational differences influence how news consumers process converging/diverging information.

5. Conclusion

People often encounter conflicting news reports, sometimes within the same media channel. The present study suggests that perceived uncertainty moderates the effects of this divergence, in ways that future research will continue to explicate. Past research on the effects of uncertainty in news coverage has consistently found that it reflects positively on science. Divergence did not produce a consistent effect in this study, something to note as researchers continue to investigate communicating uncertainty in science.

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