"What researchers now can tell us": Representing scientific uncertainty in journalism

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Abstract

Little research has been done on how journalism deals with and constructs scientific uncertainty. This paper applies Critical Discourse Analysis to explore how scientific uncertainty (and certainty) is constructed in news articles in elite newspapers written by esteemed American journalists. Categories such as discourse representation, presupposition and metaphors are examined closely in comparative readings of journalistic texts. The selected articles cover the same issue, so-called frontier research on possible biological causes of violent human behavior.

The analysis displays distinct differences between the articles as to how they construct knowledge claims in the research portrayed. It suggests how the language in articles that include several voices and opposing viewpoints, may advocate specific knowledge claims, "ways of seeing", and top-down power relations between science and the public. But the analysis also attempts to unfold a representation of uncertain science that is more substantially "multiperspectival", indicating a more dialogical and deliberative news coverage of science.

Introduction

Uncertainty is a common outcome of the scientific process and a characteristic of scientific theories. Indeed, theories in science are in principle hypotheses, claims that are valid until challenged by new empirical findings. A principal goal for scientific researchers is to explain and understand natural and social phenomena. But according to scientific norms, it is always possible to develop more precise and better explanations and no phenomenon, no matter how thoroughly studied, is fully explained or understood.

In most research fields and disciplines there does exist established theories and facts that few researchers will dispute. However, this is not the case with new and emergent research, which is characterized by uncertainty, whether this uncertainty is due to a lack of knowledge or disagreement over the knowledge that currently exists[1].

Such emergent and uncertain science is also the subject of much of the science news in the press. In recent years, science related news stories have typically dealt with complex, controversial or risk issues such as climate change, biotechnological research, the impact of nature versus nurture on behavior and the pandemic threats of the so-called avian flu and the swine flu virus. Explanations and predictions of such phenomena, or within such areas, are fraught with uncertainties, and it is a major challenge for

[1] Priest points out how most scientific controversies are eventually resolved for pragmatic reasons. However, in any given field at any given moment the contemporary frontiers of research "are characterized - in fact, defined - by the existence of competing explanations" (Priest, 2001, p. 9).

scientists to manage these. In a different context, dealing with scientific uncertainty is also a challenge for journalists who communicate to the public about science and its contributions to understanding complex systems or problems in nature or in society.

However, little research has been done on how journalists deal with and construct scientific uncertainty in the press. A major initiative to improve our understanding of these matters was the volume *Communicating Uncertainty* (Friedman et.al., 1999), a collection of articles looking at issues of scientific uncertainty and its media coverage from the multiple perspectives of communication scholars, science journalists and scientists. But although a goal of the book is to examine how journalists interpret and construct scientific uncertainty, only some of the contributions testify to being written partly on the basis of research into journalistic coverage of science (notably Friedman, Priest, Dunwoody, Stocking, Zehr, all 1999).

Stocking's contribution is in fact marked by how it stresses the need for research into this area. She claims that we are "swimming in uncertainty and downright ignorance when it comes to the questions at hand - how journalists deal with uncertainty (…) and what factors account for the observed patterns (…)" (Stocking, 1999, p. 35). She does, however, give an overview of some of the "speculations" with respect to journalists' accounts of uncertainties in science. A small, disparate group of studies touch upon this question in investigations of media content. Stocking identifies two trends in the understanding of how journalists deal with uncertainty. Most studies (e.g. Weiss and Singer, 1988; Fahnestock, 1993) suggest that journalists make scientific claims appear more certain than scientific experts consider them to be. These studies may for instance note that journalistic representations of science tend to contain fewer caveats than scientific accounts. But a few studies (e.g. Dearing, 1995) also suggest that journalists sometimes make scientific claims appear more uncertain than most scientists believe them to be. When covering controversial science, journalists may pit scientist against scientist without mentioning to what degree their views are accepted within the scientific community. Thus, some scientific theories may emerge as credible and authoritative although only a minority of scientists consider them to be trustworthy. The result is that an area of research appears as more controversial and uncertain than most scientists believe it to be.

Most of these studies are conducted within a "dominant view of popularisation" (Hilgartner, 1990) where mediated science is seen as a distorted and biased representation of originally 'genuine', objective and accurate scientific knowledge. Such studies tend to take scientific uncertainty for granted as something inherent in nature, uninfluenced by social factors. There is indeed a need for studies that do not come from an objectivist theoretical tradition, but rather are situated within a social constructivist framework, exploring how claims about uncertainty are subject to social processes.

Such investigations could emphasize how different actors use language to construct uncertainty or certainty in different contexts, depending on what they wish to achieve. Some scholarly attention has been paid to how claims about uncertainty may be used by scientists (e.g. Myers, 1990, Stocking & Holstein, 1993, Shackley & Wynne, 1996; Zehr, 1994). For instance, researchers can manage their own uncertainty by constructing uncertainty about opponents' claims to try to raise their own credibility. In this way, scientists may use uncertainty claims as a rhetorical device to persuade others or to organize some state of knowledge. In public settings scientists may also identify some point at which uncertainties will be eliminated (a kind of rhetoric that may appeal to potential sponsors of research): Although there is uncertainty now, scientific certainty will be achieved in the future.

In my analysis, I will draw on these studies' understanding of how uncertainty claims do not simply represent some underlying reality or "objective knowledge", but are socially constructed claims that are subject to social interpretation and negotiation.

Whilst the aforementioned studies suggest that scientific uncertainty is a salient part of science in public, we do need more research on rhetorical strategies or language use in journalistic accounts of scientific uncertainty. As Stocking (1999, p. 39) points out, much work is needed before we can describe with any confidence how journalists deal with and construct uncertainty in science.

Theoretical frame, analytical approach

The objective of this paper is to explore how scientific uncertainty (and also certainty) is constructed in journalistic texts. I assume that some of the analytical categories suggested within Critical Discourse Analysis (CDA as practiced by Fairclough 1992, 1995a, 1995b, 2001), offer a fertile approach in this respect. CDA may be seen as an "analysis of how texts work within sociocultural space" (Fairclough, 1995b, p. 7). It is critical in the sense that it explores how "ways of seeing" and power relations are constructed, reproduced and maintained in texts. Critical discourse analysis of journalism will try to understand how journalistic texts contribute to maintaining or changing institutional norms and practices. When studying science journalism, some key questions will be: How do texts in science journalism create meaning? Which ideologies and power relations do the texts reflect (for instance between scientist sources, journalists and the audience)?

Ideally, CDA describes, interprets and explains different dimensions of discourse such as texts, discourse practice, sociocultural practice - and the relationship between them. Within the confines of this article I must limit the scope of the analysis. In order to examine closely how language may be used in journalism

to represent and construct scientific uncertainty, I will concentrate on a few, carefully selected articles. In a comparative analysis of how three esteemed American journalists represent the same area of research at about the same time and in the same journalistic genre, the focus is on clarifying and exemplifying how meaning is constructed in journalistic texts about science that involves uncertainty and controversy. In this way I also wish to consider the applicability of some analytical concepts and categories in CDA to the understanding of how journalists represent and construct scientific uncertainty.

In discourse analysis that emphasizes close readings, there is a risk of excessive interpretations and generalizations of features on the basis of the few texts chosen. I do not think one can completely avoid this. As Fairclough remarks, one is inevitably interpreting all the time as an analyst, and: "there is no phase of analysis which is pure description" (Fairclough, 1992, p.199). Accordingly, I acknowledge subjectivity in my analysis. However, although a text may be interpreted in different ways, there are limitations to its meaning potential. In CDA, there are requirements that the analyst argues for the acceptability of his interpretations. One way of doing this, is by being explicit about one's analytical categories and procedure, and this is an objective of my analysis. At the same time, I emphasize that my analysis should be seen as exploratory and not as striving for representativity as content analysis may do.

The case

The analysis focuses on news articles written by three American journalists, Ronald Kotulak, Deborah Blum and Sheryl Stolberg. They are highly regarded; all of them have for instance won the prestigious Pulitzer Prize. Ronald Kotulak received the price in the category "explanatory journalism" in 1994, among other things for the series "Roots of violence", which included the analyzed article. Deborah Blum won the Pulitzer Prize in the category "beat reporting" in 1992 for a series on the use of primates in research. As a part of a team in *Los Angeles Times*, Sheryl Stolberg won the Pulitzer Prize in the category "spot news reporting" in 1995. The selected articles (Blum, 1995; Kotulak, 1993; Stolberg, 1993) are about the same issue, so-called frontier research on possible biological causes of violent human behavior. This multidisciplinary research field is an object of controversy and marked by scientific uncertainty (Blum, 1999)[2].

[2] Research into what has been called "the biology of behavior" and more specifically "the biology of violence" is claimed to be to be in rapid development in the period the analyzed articles were written (the 1990's), creating a new understanding of the interplay between brain chemicals and environmental factors in the development of human behavior (see Niehoff,1999). But the research is also controversial and criticized for reductionism and "biological determinism". Nelkin and Lindee epitomize the critical stance towards "biologism" in the 1990's, in their exposition of genetic essentialism, The DNA Mystique (Nelkin and Lindee, 1995). In their perspective, scientific fields are seen as reflecting priorities and dominant assumptions in the societies they are a part of. Nelkin and Lindee point to how an interest in genetic perspectives - which in the US in the 1990's may be displayed in attempts to "visualize the brain as a way to

The journalistic articles have a comparable format and may be considered as belonging to the same genre. All of them are long *news articles*. Such articles have a function of reporting information truthfully. To achieve this, journalists ideally try to get different perspectives on a news event or an issue (Waugh, 1995). Elements of *feature* writing, with narratives and other 'literary' components, are also discernible in the articles, as well as an *explanatory* purpose in the way that all three texts present key research questions so that they may be elaborated upon in the stories.

The articles are chosen bearing in mind that certain common traits should characterize the context they appear in. All are from elite newspapers - *Chicago Tribune*, *Los Angeles Times* and *Sacramento Bee* - with enough resources to let their specialist journalists work for a long time with their material and present their issue extensively. Since the three writers are distinguished specialist reporters, this also gives rise to a certain expectation as to what the analysis will show. Hornmoen's (2003) analysis of the handbook *A Field Guide for Science Writers* (Blum & Knudson, 1997), indicates how a "critical" role conception becomes more pronounced among American science journalists in the 1990's compared to what had been the dominant view since science journalism emerged as a profession in the 1930's. In the handbook, writers who give advice on how to cover uncertain and controversial scientific areas, propose a critical journalism that includes different perspectives on the topics. Considering the topic of the articles in the following analysis, as well as the period they were written (1993-1995) and the background of their writers (two of them give advice in the aforementioned handbook), one may expect "multiperspectival" articles that present different views on the research and generally draw a picture of scientific activity as a continuous process where theories are modified, rather than science as a road to assured findings and clear-cut explanations of relationships.

The use of the term "multiperspectival" is in this context inspired by Sharon Dunwoody's claim that when science becomes controversial and marked by different and often duelling viewpoints, this gives journalists the opportunity to "play a major role in constructing popular understanding of the science in question" (Dunwoody, 1999, p. 69). The journalist's power vis-à-vis "the scientific culture" lies "in the ability to select voices" (ibid: p. 69). This is also applies to the coverage of 'new science', when researchers claim that they have new findings or results. A scientist making a priority claim wishes "to control the interpretive ground and infuse press accounts with her version of reality" (ibid: p. 66). However, the claim signals the presence of uncertainty in the research, and that "may drive journalists to seek more voices in

identify the biological basis of criminal tendencies" - reflect the hope of "simple, scientifically based solutions to the complex problem of understanding and managing crime" (1995:165). The simple solutions referred to, are for instance drug treatments in order to regulate biochemical abnormalities, or methods to eliminate "unwanted" genes. When discussing the potential of misusing such research, one frequently points to the historical practice of eugenics, when some researchers recommended sterilization and segregation of 'genetically disposed individuals'. So research on possible biological explanations of violent behavior has been - not least in the US in the 1990's - an object of a larger and heated public debate about how or if such research is marked by (or creates) a certain ideology with unfortunate social consequences.

their stories (…) trigger a search for credible sources who may react to the claim itself" (ibid: p. 67).

The presence of multiple voices in news stories about emergent science indicates for Dunwoody a journalistic control over the meaning of the science covered, over how the science is to be understood in public. As I interpret "multiple voices" or "multiperspectival", these expressions not only refer to a use of various scientist sources who give different interpretations of findings in the research covered and in this way contribute to a nuanced or balanced presentation. "Multiple perspectives" may involve disparate basic understandings of how knowledge is produced and different interpretations and views - including lay opinions - of what social consequences the research covered is assumed to have[3].

In accordance with Dunwoody, an assumption underlying my analysis is that it is an indication of a journalistic control if the texts include multiple perspectives on the research covered. But assessing to what extent articles are multiperspectival requires a close inspection of *how* different voices and perspectives are incorporated in the texts. A news article about uncertain science that includes several different voices can, on the surface, appear "multiperspectival". However, closer inspection may reveal that the text is primarily transmitting and advancing the "ways of seeing" and the rhetoric of a particular group of researchers. It is not least in this respect CDA offers a critical approach to understanding how scientific uncertainty is dealt with in journalism.

Analytical categories

In the following, I briefly present analytical categories, linguistic levels and questions that I assume are relevant in the analysis of journalistic representation of scientific uncertainty.

Discourse representation

Distinguishing between different levels of reported speech gives an understanding of which voices and what claims about uncertainty/certainty are legitimized in a text. Journalistic texts are normally a mixture of *direct* and *indirect* speech and *the journalist's report*. The latter refers to those parts of a journalistic text that are presented directly by the journalist and not attributed to other text participants. Reports are rarely "neutral" with respect to the various voices they represent. Some voices are legitimized by being taken up in the journalist's report. Thus, questions in my analysis are: How are different voices

[3] The term "multiperspectival news" was introduced by Herbert Gans (1980). Compared to a traditional understanding of objectivity as a balancing of views, the term expresses a more radical ideal of including various basic perspectives - including non-expert perspectives - in news articles. In this way, multiperspectival news could become the bottoms-up corrective for the mostly top-down perspectives of the news media.

represented in the texts? Are some of them legitimized in the journalist's report?

Presuppositions

Presuppositions can be described as propositions text producers take for granted. The one who makes an utterance puts different suppositions in the "background", as when the definite description "the Soviet threat" (that occurred frequently in newspaper reports - see Fairclough, 2001) presupposes that there is a threat (towards the West) from the Soviet Union. Presuppositions may have an ideological function by taking propositions for granted, in this way inviting the reader to share controversial claims as common sense assumptions. I will analyze the texts with an eye to how they may presuppose relations (causal relations, "knowledge") in a way that conceals scientific uncertainty or controversy.

Process and participant types

This level of analysis looks at the processes represented and how they are represented, as well as which actors tend to be portrayed as responsible for the processes. Who are the *agents* initiating activity and who are the *patients* influenced by other's activity? The use of modality, expressing how different speakers relate to the referential content of their utterances, should also be taken notice of in an analysis of journalistic representations of scientific uncertainty. For instance; to what extent are modal verbs such as 'can' and 'may' used when presenting relationships suggested by "new research"?

Metaphors

Metaphors may be ideologically potent by constructing what they refer to in ways that marginalize different or oppositional perspectives. How can the choice of metaphors present some relationships as "natural" and give some views preferential treatment? Who may be considered the sources of key metaphors used?

By looking at the use of metaphors (as well as other analytical categories such as presupposition and process and participant types), one may also get an impression of the image of science that the texts construct. In the scientific institution, there are different views on what science is and how it develops. Schematically outlined, there is on the one hand an inductivist view of how science develops. The image here is of continuous progress, an accumulation of new truths that are more and more strongly verified. This *positivist* view (Kjørup, 1991) implies that scientific research is about discovering and describing facts

and detecting the relations between them. On the other hand, there is a tendency, inspired by the science theorist Thomas Kuhn, to see scientific activity as a puzzle-solving process where scientists in a given paradigm try to get bits of facts to fit with a theory. According to such an understanding, what may appear as the best solution to a puzzle today, can be rejected by a different approach later on (Kjørup, 1991). Different views of science as either an accumulation of facts that scientists discover or a puzzle-solving/theory-modifying process designed to produce better explanations of reality, imply different views of the extent to which research provide certain knowledge. With a particular attention to the use of metaphors, a question in the analysis then becomes: Which image of science do the different texts construct?

News frames

Although CDA normally does not encompass a study of news frames, I find this concept fruitful for the purposes of analyzing journalistic representation of scientific uncertainty. News frames may be understood as conceptual tools which the media rely on to convey, interpret and evaluate information (Neuman, Just, & Crigler, 1992). Framing involves selecting some aspects of reality and making them more salient in a text: "in such a way as to promote a particular problem definition, causal interpretation, moral evaluation and/or treatment recommendation for the item described" (Entman, 1993, p. 52). Semetko & Valkenburg (2000) identify five frames that in their view "largely account for all the frames that have been found in the news" (p. 95).

The conflict frame stresses conflict between individuals, groups or institutions as a way of capturing the audience's attention. *The human interest frame* brings a human face or an emotional angel to the presentation of an event, an issue or problem. *The economic consequences frame* reports an event, issue or a problem in terms of the economic consequences it will have for an individual, group, institution, region or a country. Stories using *the morality frame* may contain moral or social messages about how to behave. *The responsibility frame* presents an issue or a problem in such a way as to attribute responsibility for its cause or solution to the government, an individual or a group.

The analysis looks at which frames are used and what these may imply for the representation of uncertainty/controversies in the research covered.

Genre

Above, I determined the journalistic genre the texts belong to and its social function. This provides a

frame for the analysis - for the interpretations that are "acceptable", so to speak. In the analysis, questions concerning genre (and discourse) are: What genres and discourses[4] are drawn upon? What is the relationship between the discourses? Are some more dominant than others?

The analysis

The texts will not be analyzed schematically at one analytical level at a time. Rather, I want to alternate more flexibly between different levels, highlighting and comparing parts of the texts so as to throw a light upon how they represent and construct scientific uncertainty/certainty.

Article one: Stolberg's "Fears Cloud Search For Genetic Roots of Violence"

The headline and lead in Stolberg's article introduces several topics or perspectives for the story. The headline indicates a moral message on behalf of research on "the genetic roots of violence", whereas the first sentence in the lead suggests what the fears consist of from the perspective of sociology. The last sentence ("Scientists are sharply divided") establishes a division among 'scientists'[5], without specifying what they are disagreeing about. Although the headline and the lead in this way seem to sprawl in different directions, a frame of conflict is set for the story.

In the article's body copy (or "body text") two areas of dispute emerge. One of them concerns the question of what role and how significant role biology plays in the development of violent behavior (e.g. paragraph 18. Paragraphs from now on referred to by a numerical[6]), whereas the other is the question of what the social consequences may be if research focusing on possible biological causes of violent behavior is prioritized.

In the frame that organizes the story[7], the conflict is between mainly two parties. On the one hand, there are the representatives of the search for 'the genetic roots of violence'. On the other hand, there is a more diverse group of critics of this research.

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[4] Discourse in this context can be understood as "a way of signifying experience from a particular perspective" (Fairclough, 1995b, p. 135).

[5] "Scientist's" conventionally refers to researchers working within the natural sciences, or researchers working within an empirical-analytical approach, in this way excluding quite a few researchers working within "Sociology'.

[6] Headlines, leads and paragraphs in the body text are numbered, not the textual elements in the so-called 'fact boxes' accompanying the body text in two of the articles (Stolberg, Kotulak). However, I will also analyze textual elements in these fact boxes.

[7] The text also has a marked human interest-frame by the recurring focus on a certain "human face" (Linoilla, in the beginning and end of the story), something that may invite the reader to a preferential interpretation of the different views expressed in the text.

Already the article's headline suggests a dichotomy between two discourses that are attributed to the different sides of the conflict. On the one hand, there is an emotional discourse, on the other hand a rational discourse. The use of metaphors in the headline invites to interpret feelings of fear as standing in the way of something that normally isn't (or should not be) 'clouded', that is, rather an enlightening activity (the 'cloud'- metaphor's antonym is 'enlighten'). In addition, the fears stand in the way of potential findings, something that is implicated by the verb 'search' referring to the research process.

Dominant image of science

The researcher Linnoila is introduced in a context where a serious problem of violence in society is presented ("As gun detectors…" (2)). In this context, the neuroscientist's work appears as a potential 'answer' to the problem. The question that Linnoila is said to struggle with ("What transforms…" (2)), presupposes that there is something that transforms innocent little children into brutal teenagers and adults. It is also implied that this is something that the researcher may explain (by the verb 'unravel' (2)). The presentation of a researcher's problem harmonizes with the picture of scientific research as a puzzle-solving process.

At the same time his activity is portrayed in such a way that it gives the impression of being able to detect *certain* causal relations. The metaphors support a view of scientific research as a discovery process: *struggle* (struggling), *quest*, *search* (searching), *pursuit* (pursuing) and *hunt* (hunting). The heroic hunt- and discovery-metaphors imply potential answers and solutions. What it is that shall be unraveled is depicted as "a great mystery". The use of attributes such as "great" about the mystery and "frantically" about the scholar's search may be understood rhetorically as an indication of the necessity of finding explanations and solutions to the violence problem.

Throughout the text a number of expressions do suggest that there is uncertainty connected to research on the causes of violent behavior. Worth noticing is that such expressions of scientific uncertainty are not primarily presented by the critics of this research. Rather, the representatives of the research portray the uncertainty as a lack of knowledge about the relations between biology and violent behavior, and about how environmental and biological factors work together. This may be expressed in both direct and indirect speech: "(…) there is growing evidence that some small component - I have no idea how big yet - of violent behaviour has a genetic basis" (40). But, Linnoila adds, there are more that 20 genes that could control the manufacture of the brain chemical. And it will be at least a decade before he understands how they work together - in connection with other factors (…) (37).

In both of these excerpts it is presupposed that in the future the research will be able to provide certain

knowledge of these relations. In other words, expressions of uncertainty presuppose that the uncertainty will be removed. It is worth noting how such future perspectives also are presupposed (and legitimated) in the journalist's report, not only in the reporter's speech (31 and 32).

Dominant discourse

The opening focus on Linnoila invites the reader to sympathize more with the side of the conflict that he represents than with those who emphasize social factors as the cause of violent behavior. Sympathy is created in the journalist's report by contrasting Linnoila's work to the research of most of the 'others' ("most are pursuing obvious leads…"/"Not Linnoila" (3/4)). Linnoila is represented as one who defies conventional wisdom. The portrayal evokes the archetype of the master detective who follows his own leads, supporting the conception of progress in science as a product of a peerless individual. The positive identification with Linnoila's perspective is also constructed by a more negative attitude towards the critics of this research, explicitly expressed in the journalist's report: "But not everyone's mind is so open" (8).

The distribution of sympathy in the conflict becomes apparent when characterizations of representatives of the different parties, for example Linnoila and Breggin, are contrasted. Whereas Linnoila is portrayed as a researcher who takes initiatives and expresses himself on the basis of extensive empirical data (5), Breggin is portrayed as one who works against other's initiatives ("has made a career of fighting medical approaches to social problems" (24)) and expresses himself in capital letters ("not one to mince words" (25)) - and without the support of empirical data - about the consequences of this research. The journalist's report frames the statements of these two sources with a different degree of distance to what is said. Where Breggin is represented by using an emotional discourse marked by the use of exclamation marks in direct speech, and by the use of adjectives such as "frightening", "horrifying" and "massive" referring to what he foresees as a consequence of this research, Linnoilas statements are accompanied by a sober and positive expression for engagement in rational activity: "Linnoila explains simply" (7).

As opposed to the critic's views, Linnoila's temporary conclusions are also authorized by being taken up taken up in the journalist's report without attribution. Early in the article, one can read the following: (…) he says he has proved over and over again that people with low levels of this neurotransmitter are prone to impulsive, violent acts, especially when they abuse alcohol (5).

In one of the fact-boxes accompanying the body text (see the appendix), this is transformed in the following way: Linnoila's work has repeatedly shown that people with low levels of serotonin (…) are prone to impulsive, violent acts.

The traces of indirect speech that emerged in the first excerpt by an attribution to the speaker ("he says

he has") have disappeared and been replaced by the journalist's report without attribution. In a salient part of the article's layout, what is elsewhere attributed to a particular text participant is elevated to a status of being a 'universal matter of fact'.

The rational agents and the emotional 'others'

A conception of scientific activity as normally being detached from the domain where social tensions develop can be traced in formulations such as: "scientific pursuits have become entangled in delicate discussions of race. Social tensions are spilling over into the laboratory." (11). It is implied that social tensions and discussions of social consequences of research, normally do not belong to the domain of science. Metaphors such as "entangled" (twist together, trap, catch, distort, confuse) and "spilling over" (pour out, seethe, disgorge) are loaded with negative connotations, and they contribute to constructing a picture of the normal (and ideal) preconditions for research: A "pure" and autonomous position. The image is evoked of an activity carried out by a group of curiosity-driven discoverers ("pursuit") who normally work without "intrusion from outside"[8].

The way two actors - one from each side - are represented, invites the reader to interpret one of the participants claims of having certain knowledge as being more emotional and to a lesser degree grounded in rational thought than the opponent's claims.

To be sure, both Billings and Raine are represented in direct speech by equally categorical assertions with respect to how certain the knowledge they stand for is (Billings: "We know…", "It's not the genes that…", and Raine: "It is irrefutably the case…", "That is beyond scientific question"). But there is an essential difference in the way the two are portrayed in the journalist's report. Where Billings is referred to as one "who has spoken out against such research", Raine is represented as one "who has reviewed all published research that attempts to link biology to violence." The journalist's report contributes to giving the latter's statement 'scientific' weight and greater credibility than the others.

Raine's viewpoints are also legitimized by a reference to a research report. The choice of adjectives to characterize the report and its authors strengthens the authority of its message: A "massive" report that is written by "19 of America's most prominent academics" who are brought together by "the most prestigious group in the nation" (19). Moreover, the authority of the message is strengthened by expressing reservations with respect to how certain knowledge the research is able to provide. The language in the report is labeled as "cautious" (21), while the message in direct speech also expresses

[8] This so-called 'republican' view of science is expressed by Polanyi (1962), amongst others.

cautiousness: "The human body may hold clues to what makes people violent" (21). Modal verbs such as 'may' contribute to what Fairclough characterizes as "the cautious (and authoritative) discourse of science (…) in their careful specification of probabilities" (1995a, p. 131).

It is not at least by being contrasted against de oppositional 'others' more categorical statements, that the discourse of one of the parties takes on a rhetorical power as the authoritative discourse, the one that is to be trusted.

A similar division can be traced as the representatives of the research on the biological causes of behavior increasingly are portrayed as victims of a fierce, emotional reaction from a group of people who are referred to as a faceless mass ("people" 53, "nobody" 56). A pattern becomes evident: on the one hand are the good forces who take an initiative to control a social problem, on the other hand, an 'evil', emotionally loaded reaction that tries to choke the initiative. The psychiatrist Goodwin is portrayed as a "respected" and energetic person ("conducted studies", "called for government scientists to embark on a large-scale violence initiative" (42)), whose choice of words on one occasion "sparked a huge uproar" (43). In the journalist's report, there are no examples of Goodwin's statements that make it seem probable that his words could be interpreted as racist and create fierce reactions. In this way, the journalist's report (via omissions and negatively loaded nouns such as "uproar" and "fury" (43)) contributes to construct Goodwin's opponents as irrational: They are people who overreact emotionally.

However, the "irrational" party is depicted as the one who has ideological power and defines the accepted wisdom in this area. It is not only Goodwin who becomes victim of this hegemony ("Goodwin was forced to resign" (44)). In a similar manner, the initiative of participants such as Wasserman and Mednick is hindered by the opponents ("was forced to cancel" (47), "the funding was withdrawn" (55)). An agentless passive construction is used in these formulations, something that reinforces the impression of people as victims of a prevailing ideology. In this way, sympathy is created for one side of the conflict: People belonging to this group represent a "human face" and a potential progress that is resisted by a reaction that to a lesser degree is based on scientific thought and practice.

Summarizing

Elements within the conflict frame of Stolberg's text invite the reader to sympathize with the representatives of one side of the conflict. Throughout the article, this side is represented as more rational and less emotional than the other side. The uncertainty in their scientific research is portrayed as a "lack of knowledge". It is presupposed that in the future the research will come up with answers to what the relations between biology and violent behavior are. It is also assumed that the research has the potential

to solve a social problem. The moral message is that a solution is only possible if an emotional and political opposition against the research does not stand in the way of progress.
Uncertainty is used rhetorically in two ways in the text:

- as an expression of a "provisional lack of knowledge", the accentuations of scientific uncertainty indirectly function as an argument for more research (all the suggestions that better explanatory models and a more adequate method of treatment will be developed). The rhetoric linked to a provisional lack of knowledge does not only characterize some of the represented speech, it is also taken up in the journalist's report. In this way, the rhetoric becomes more effective. It achieves the status of an "objective account of reality". Or at least it will be a conventional reader expectation that the journalist's report is as objective and truthful as possible;
- secondly, uncertainty is used to construct a "scientific" cautiousness in opposition to a more bombastic discourse used by the opponents, in this way making one party's views appear more trustworthy than the others.

Article two. Kotulak's "Why some kids turn violent"

An explanatory purpose is more noticeable in Kotulak's text. The author of the article aims to describe and elucidate not only the researchers' explanatory models with respect to the research question: "What happens inside a developing brain to turn a child into a killer?" In the text, the research question is linked to an increasing problem of violence in society in such a way that an impression is created that the portrayed research can explain "the huge rise of impulsive, hot-blooded crime in the U.S" (57). In addition, the article attempts to give an account of the causes of "cold-blooded", criminal behavior.
One thing that distinguishes this text from Stolberg's is that it does not include voices that oppose the research described. It also gives a different representation of the relations between causal factors and violent behavior - and how certain these relations seem to be. Kotulak emphasizes more strongly the interplay between biological and environmental factors. The assumption is that the brain adapts to a threatening environment, and that environmental factors can influence the brain's production of two chemicals and make "genetically vulnerable children" more prone to violence.

Images of science and representation of uncertainty

A *responsibility* frame is preferably used in the sense that an understanding of - and a potential solution to - a postulated "violence epidemic" in society is ascribed to the portrayed research on "the biology of

violence" and its practitioners. The text includes explicit expressions of how the scientists hope that their research will lead to "prevention and treatment" (85). Some *moral/social* messages are formulated on the basis of the knowledge that the research supposedly has created. Such messages are represented in the direct speech of different researchers, for instance: "If we don't invest in the early rearing environment of our children, we're going to be paying the bills for the rest of their lifetimes" (86).

Rather than personifying the research as Stolberg does, Kotulak refers frequently to "scientists" and "researchers" in a way that depicts knowledge production in science more as a collective effort. The portrayal of the processes that these actors initiate or engage in (e.g.: *scientists discover* ("Their discoveries") (4), *researchers (…) can tell us* (7), *Scientists (…) have found* (9), *scientists have observed* (12)), imply that answers and findings already exist.

The constructed image of science is mixed. There are some expressions of research as a process where hypotheses are put forward and theories modified (for example: "one study (…) tended to confirm the idea that brain chemistry determines…" (60)). But the emphasis is on research as a discovery process where facts are revealed. (e.g.: "The research also has produced an unexpected and ominous revelation" (8)).

The introduction's emphasis on revealed knowledge establishes a pedagogical speech situation. The main actors in the text are given clear functions and roles by modes of reference. The researchers are referred to as the authoritative "others" by formulations such as "scientists have found". They are in a position that enables them to convey news to a "we": "What researchers now can tell us…" (7). A division and power distribution between researchers and "us" is immediately made clear: One the hand are the knowledge producers, on the other non-informed readers, and between them is the narrator in a role as a conveyer of knowledge. Sufficient authority is ascribed to the implicated journalist to enable him to take on the role of educator, apparent in the way he directly addresses the reader in the journalist's report: "Consider the infant brain…" (5). A pedagogical speech situation is supported by the use of metaphors to illustrate complex phenomena that the researchers study (for example "chemical pathways of aggression" (6), later: "the locus coeruleus, the brain's alarm network", "noradrenaline highways" (48)).

Voices of different sources are linked together in the text in a way that reinforces the impression of a collective enterprise marked by consensus in the understanding of "the biology of violence". Sources with different scholarly backgrounds are represented in direct or indirect speech, providing nuances to the explanation of how violent behavior is developed. Typical for Kotulak's text is a use of reported speech in order to elaborate on issues that are introduced in the journalist's report. The authority of the experts is called upon in order to complement or support the propositions that are presented in the journalist's report. To give an example: The journalist's report sketches out how the brains of some children react to a

threatening environment. The description ends: "These are the PTSD children" (49), before a scientist source in direct speech is allowed to comment on what is put forward in the journalist's report: "They're in double trouble", said Baylor's Perry. The statement is followed an elaboration in indirect speech - or a speech with a more ambiguous status between the journalist's report and indirect speech (50,51) - before the journalist's report takes over again (52), now with a reference to a new researcher and her findings, findings that then again are elaborated upon by yet another researcher in indirect and direct speech (54, 55, 56).

Represented in such a pattern where different voices complement and substantiate each other's propositions, it becomes difficult to differentiate between them. The researcher sources and the narrator change places in the role as educator. The impression is created that they contribute with different pieces to a larger puzzle and a more complete understanding of the field. This weaving together of voices also creates an impression of consensus with respect to what research in this area has achieved and how one is to interpret different findings. A picture of an uncontroversial field of research emerges, with few signs of the scientific uncertainty that normally characterizes science in the making.

Uncertainty about how uncertain the knowledge is

An introduction loaded with presuppositions constitutes a preceding discourse of "certain" knowledge and "natural" relations. Thus, a connection between biology and violence is presupposed in "the biology of violence" (2), whereas the formulation of the researcher's question (3), presupposes that something happens in a developing brain that turns a child into a killer. By referring assumptions about a connection between biological components and violent behavior to a presupposed space, they are given a character of being "already known". In this way one conceals controversies with respect to the question of whether or not or to what degree biological components have any influence on the development of violent behavior. The question in Kotulak's article turns out not to be a question of whether or not biology plays a role or how great a role it possibly plays (which were questions within Stolberg's conflict frame). Rather, the question is: In what way does biology play a role?

Kotulak's text has a tendency to establish connections between genetic factors and human behavior as more certain than Stolberg's text does:

Table 1: Kotulak/Stolberg comparison

Kotulak	***Stolberg***
Scientists also have found that aggression genes, those that raise a person's propensity for violence, may be passed on to new generations. Some researchers believe that the increase in female criminal violence since the 1950s may be an early sign of how the genes of violence already are building up in the population. (9)	Now, Linnoila is searching for "vulnerability genes" that create this serotonin deficit. (6) (…) their discovery of the so-called aggression gene applied only to the one family they studied (...) (36)

By the presupposition of "aggression genes" and "the genes of violence", the existence of a connection between genes and aggressive/violent behavior is taken for granted. Kotulak's text also presupposes that such genes increases a person's inclination to violent behavior, in this way taking for granted their way of functioning. In comparison, "vulnerability genes" is put in quotation marks in Stolberg's text, while the phrase "so-called" is linked to "aggression gene". In a text in which the journalist's report points out that "no scientist has suggested that there is a single gene for violence" (39), this use of the phrase "so-called" and quotation marks may be interpreted as signalling an approximate and not exact (according to scientific criteria) representation of relations, based on the juxtaposition of words from everyday language with its different categorization of reality. In other words, the texts signals how expressions such as "vulnerability genes" and "aggression gene" simplify assumed relations between genes and behavior compared to what adequate specialized terminology would have done. The absence of such markers in Kotulak's text contributes to a more unreserved exposition of the relationships than in Stolberg's text.

However, some formulations in Kotulak's text tend to undermine the supposedly certain connections. Already the relationship between the headline and the subhead suggests a certain discrepancy when the use of a modal verb such as "can" in the subhead "Abuse and neglect can reset brain's chemistry" follows a headline implicating an explanation to why some children become violent. The subhead's proposition seems in this way to modify the headline's presupposition of something causing children to turn violent. The two heads seem to draw on different discourses: the news article's rhetoric in order to arouse interest and the cautious discourse of science.

In a similar way, some propositions may contribute to modify relations that it is postulated that this research throws a light upon:

Table 2: Comparison of parts of Kotulak's text

Their discoveries are shedding new light on the epidemic of violence that is being inflicted on children and that they are inflicting on others. (4)	"There truly are novel mechanisms by which the environment can change genetic expression within a generation," he said. "What role it plays in our current epidemic of violence is not known right now, but the possibility that is does play a role cannot be ignored." (76)

Linnoila's statements in direct speech, undermines what is stated the introduction (left column), at least what concerns the relationship between environmental factors, genes and the "violence epidemic in society". The last clause of his last statement ("but the possibility…"), even implicates that it is possible that there is no connection between these factors and the "epidemic of violence".

Discrepancies may also occur between different propositions in the journalist's report, in a manner that may create some uncertainty about how certain the produced knowledge is.

Table 3: Comparison of parts of Kotulak's text

The research also has produced an unexpected and ominous revelation: Environmentally induced brain changes can become permanent, encoding into genes a propensity for aggression and violence that can last a lifetime. (8)	Now they (researchers) suspect that bad experiences can change genes and that those changes can quickly become permanent. (73)

What is presented as a revelation in the introduction, is later - by the use of the verb "suspect"- modified to being an assumption among the researchers.

Such partly conflicting expressions of uncertainty/certainty indicate that a scientific field "in the making" is the topic of the article. But expressions of uncertainty are hardly explicitly marked in the text. Rather, the text constructs a certainty on behalf of the research it represents.

Some representations of the researchers in direct speech can be read as attempts to substantiate their claims of knowledge. This text may for instance use expressions of emotions in a different way than Stolberg's text. In the latter, such expressions were interpreted as discrediting the trustworthiness of some actors as opposed to the rational actor's use of a "cautionary" scientific discourse. In Kotulak's text, some of the quoted researchers express an emotional engagement with respect to what the research supposedly has shown: "It is frightening to think that we may be doing some very dreadful things to our children" (20); "It's really scary to watch the transition from high arousal to low arousal. (…) they develop this incredible icy quality of being emotionless" (67); "It was amazing to see how genes for increased aggression could be transmitted to male and female offspring of parents who had been exposed to aggression-promoting environments", Cairns said (79).

When such expressions of feelings are represented as a reaction to relations that research supposedly had produced, their function above all becomes to strengthen the status of the research as certain knowledge and contribute to the reader's acceptance of the explanatory models.

Summarizing

Kotulak's text tries to explain research on "the biology of violence" by starting with a claim that it throws light upon an increasing violence problem among young people in the American society. In contrast to Stolberg, Kotulak emphasizes how research already has made discoveries that may account for such an increase.

The text represents its topic and its actors in a way that creates an impression of consensus among researchers and certainty with respect to what relations the research has shown. Immediately, a pedagogical teaching context is established. Scientist sources and the implicated journalist shift in the role of educating the readers in a pattern where different voices supplement and confirm each other's propositions.

However, supposedly certain relations demonstrated by the research tend at some points tend to be undermined by more cautious representations of it. This indicates that an emerging field of research is being represented.

Article three. Blum's "'Natural Born Killers' may be more than a movie title"

An explanatory purpose is also apparent in Blum's text, not least in the way it applies metaphors to illuminate brain processes (e.g.: "Chemically, the brain is a noisy place, nerve cells chattering constantly to each other…(28)). But the text does not stress that the research already has come up with more or less 'certain' answers. It presents different researchers perspectives on the causes of violent behavior and gives examples of the research that their views are based on. By alternating between the different perspectives, a light is thrown on the mixture of biological and environmental factors in the development of violent behavior.

Frames, images of science and representations of uncertainty

The most salient news frame is a *human interest*-frame. As in Stolberg, the research is given a human

face by dwelling on the same researcher in the beginning and the end of the story. The reader may also be brought in close touch with other actor's "ways of seeing", although expressions of an emotional reaction to what the research has produced are not as marked here as in Kotulak. Elements of conflict are represented in the text, but such a frame does not organize the article as in Stolberg. As opposed to the other texts, this one lacks explicit moral and social messages.

The article's image of science points in somewhat different directions. The research is situated in a context of an increasing violence problem in society (12,13), in a way that gives the impression that it potentially will be able to solve the problem. In the journalist's report it is pointed out that the question for researchers like Hare ("What is the biology of human ice?" (12)), is not an academic question: It is relevant to pose it in the light of the increasing violence problem. The question is formulated in a way that presupposes a biology of psychopathology. When the journalist's report remarks about the researcher that: "He is still not sure" (5) of how human beings lose their ability to empathize, the implication is that he probably will be sure one day. So there are points in the text where the research is portrayed as potentially capable of producing certain knowledge. But the role of the research as a potential problem solver is very much implied here compared to Stolberg's text.

The portrayal of Hare's work draws discursively on the crime genre's conventional depiction of the murder investigator's work: "he came up with some chilling evidence" (5). The depiction of the research objects as emotionless people reinforces the parallel to a stereotypical relation of the genre: The detective confronting a cold-blooded murderer. The text thus draws upon a popular genre with stock figures - such as the detective who is fascinated by murder mysteries and who tries to understand the psyche of the ones he is investigating ("And it's those people, the ones who read "death" as a collection of letters who fascinate Robert Hare" (4)). The traces of well-known stereotypes may invite the reader to interpret the researcher's possibility of producing knowledge in a particular way. The parallel to an expectation that the detective will solve the murder mystery is that the researcher will be able to "solve" the research question.

However, compared to Stolberg and Kotulak this text constructs a somewhat different picture of the research in the area. For instance, Levinson elaborates in the following way on the interplay between environment and biology in the development of "cold-blooded" behavior: "People who believe in pure biology would say that we are selecting for survival traits," Levinson said (21).

Levinson is represented by a reflexive comment that makes it clear how different researchers' language and explanatory models (as he sees it) are influenced by different belief systems. In this way, the reader is invited to relativize the knowledge put forward. That the research is linked to different basic theories or concepts of human behavior, is emphasized by formulations that express disagreement between different parties: "Hare firmly believes that the ability to kill without remorse is based in biology…" (15), "Levinson

stands firmly against the notion that some inborn kink in the brain causes cold-blooded behaviour" (16).

A collective scientific rationality is not taken for granted. The image of science as a discoverer of 'facts' in the world is replaced by a picture of science as an activity where ideas, concepts and hypotheses are developed and then modified, rejected or changed in the light of knowledge created by different empirical experiments. The significance of developing concepts in science is reflected in the journalist's report when it is stated right after the last quotation above: "That idea is borne out by the work of Bruce Perry" (22). The researchers work is represented as a process of developing and modifying theories. For instance, in the journalist's report: "Perry speculated" (40), "Biologists suspect" (31) and "He (Perry) suspects" (35). In the following excerpt, sentences are thematically woven together in a pattern where it suggested how hypotheses are developed, experiments conducted and findings presented, before the assumptions are modified and developed in the light of new experiments that have suggested other relations. Some researchers speculate that such people have under-aroused nervous systems, that they need the kick of violent behavior to bring them to normal activity levels. Raine and his colleagues scanned the brains of California murderers, looking for clues. They did find unusually sluggish brain activity, especially in the regions of the brain that regulate emotion (42). But like Perry, Raine has become convinced that internal biology alone does not explain this. For a while, he speculated that simple injury might derail the brain, might even help explain such lethargic brains (43). "Kids fall out of trees, are hit by cars, it's hard to get through childhood without some kind of trauma," he said. "There's lot of evidence tying brain injury to crime. But there's plenty of us who got hit in the head and didn't become criminals" (44). His most recent work suggests a risky combination (45).

The description of how Raine alters his views in the light of experiments, contributes to an image of the research process as continuous attempts to perfect one's explanatory models. Raine's research area is represented as emergent science. Expressions of how his understanding is modified, creates the impression that it is always possible to develop more precise models to explain the phenomena studied. By relating new research to earlier research it is placed in a historical context, so that a single experiment appears as part of an ongoing process rather than as a revelation of isolated "facts".

The researcher's activities are represented in a way that implies reservations with respect to claims of certain knowledge: "Perry's work suggests…" (35), "His (Raine's) most recent work suggests…" (45). To be sure, the actors may be presented as certain of the explanatory power of their newest models, as in the example above: "like Perry, Raine has become convinced that…" But such expressions of "certain knowledge" are attributed to the different actors, not legitimized as "public matters of fact" in the journalist's report. In this way, the headline's reservation with respect to the existence of a biological disposition to violent behavior - expressed by the modal verb "may" - articulates the attitude of the

implied narrator/journalist towards the claims of knowledge in the research.

Perspective alternation

But as suggested, assumptions about relations between biological and environmental factors and violent behavior can appear as "relative truths" in the text, depending on which actor's perspective is dominating the discourse. The term "perspective" refers more precisely to how the text sees its world through a certain point of view: How certain persons (and the group or institution they represent) let the world appear in a particular way, with particular eyes, thoughts, evaluations and concepts (Hellspong and Ledin 1997). An actor's perspective can emerge by the use of personal pronouns or phrases expressing speech acts or mental processes, for instance: "What Perry fears is that…" (47).

There is a tendency that the narrator invites the reader to identify with the different views as they are presented. When Hare's perspective dominates in the beginning, the reader is invited to sympathize with it. This is partly done by the division between "us" normal and the emotionless "others", in accordance with the referred "evidence" in Hare's experiment. The detailed description of the approach in his experiment makes the findings appear trustworthy. But the perspective changes with the representation of Levinson. When he is introduced (16), it becomes evident that not only is his view contrary to Hare's. The journalist's report also invites the reader to sympathize with Levinson's position. This is done by a negative description of the view that he opposes, particularly by the use of the adjective "some" in the sense "one or another" used about the "inborn kink" in the formulation: "Levinson stands firmly against the notion that some inborn kink in the brain causes cold-blooded behavior." Possibly, the voice of the source is heard here. Nevertheless, the reader is invited to sympathize with Levinson's perspective, which actually abolishes the marked division between normality and psychopathology in the representation of Hare's view.

In a similar way, the journalist's report associates itself with the perspectives of other actors. The reader is invited to share Perry's perspective in a formulation such as: "As he has learned, the heart is not a liar" (25). Perry's view deviates from Hare's by emphasizing environmental factor's significance in developing violent behavior (54-57). The journalist's report can invite the reader to favour such a perspective instead of the view that is genes that rule. Thus, one can read the following: some scientists suggest that genes rule here, that each of us may inherit the "settings" for influential neurotransmitter levels. Others, such as Perry, argue against such simplicity. True, we may be predisposed to a certain brain chemistry, but there's nothing permanent about it (33).

The paragraph exemplifies a smooth transition between the journalist's report and indirect discourse and

creates an ambiguity with respect to whether or not the different views are represented "neutrally". I interpret it as Perry's perspective is being legitimized, in spite of an apparently balanced exposition. The reader is indirectly invited to be more positive to Perry's model by the implicit evaluation of the other model, in the formulation: "Others (…) argue against such simplicity", where it is presupposed that "such simplicity" characterizes the "genetic" model. By its conventional meanings such as "straightforwardness" and "obviousness", the use of the term invites one to attach less authority to the "genetic" perspective.
It is worth noting how the perspective changes again towards the end of the article. It is Hare's perspective ("In Hare's mind…" (66)) that is the final one: In direct speech he also gets the last word in the article's circular composition, something that again invites the reader to ascribe an authority to this 'genetic' perspective that is on the level of the others.

Summing up

The alternation between different perspectives, with an apparently contradictory identification in the journalist's report, contributes above all to construct an image of an emergent scientific field, characterized by disagreement about explanatory models among researchers. The reader is invited to view the field through the eyes of different actors and in this way get an impression of different interpretations of the causes of violent behavior. Above all, the article creates an impression of a scientific field characterized by uncertainty and lack of consensus. Not only does it achieve this by alternating between perspectives. It also includes expressions of reservation with respect to the conclusions that may be drawn from the research. Even though the text at some points implies that the research will produce some certain answers, it creates a somewhat different picture of an emerging scientific field than Kotulak's and Stolberg's text. Greater emphasis is put on research as a process of modifying theories than on research as a discoverer of 'facts'. The text also suggests that research may be linked to different systems of belief or different basic conceptions of human beings.

Conclusions

The analysis has displayed distinct differences between the articles, from Stolberg's moral presentation of a "rational" search for solutions that is resisted by an emotional reaction, through Kotulak's consensus-marked presentation of connections between biology, a threatening environment and violent behavior, to Blum's alternation between various perspectives on the causes of violent behavior. The frames for the

articles are partly different, as well as the extent to which they personify the material and emphasize the applicatory value of the research.

Particularly, the articles differ in how they present the claims of "certain" knowledge in the research portrayed. Different images of scientific activity dominate in the articles. Whereas Kotulak and Stolberg represent research primarily as a pursuit and discoverer of answers and solutions, Blum emphasizes research as a process of developing and modifying theories. Kotulak and Stolberg also *presuppose* "certain" knowledge to a greater degree than Blum, and the latter expresses more reservations (e.g. through modality) than the other two as to how certain knowledge the research will be able to produce. In Kotulak and Stolberg there is a stronger tendency than in Blum to legitimize claims in reported speech as "certain knowledge" in the journalist's report.

There are differences between the articles with respect to using uncertainty rhetorically. In Stolberg, claims about uncertainty (as "lack of knowledge") appear as an argument for doing more research. A similar rhetorical use of uncertainty cannot be traced in the other texts. The close analysis has also suggested tendencies to contradictory expressions of how certain knowledge the research has produced. Particularly in Kotulak, allegedly certain relations at some points tend to be undermined by expressions of reservations with respect to such relations.

In all, Kotulak's and Stolberg's are typical of a traditional journalistic practice of reporting science, in the sense that they primarily communicate and promote the findings and assumptions of a limited group of sources and present their research as a quest for certainty (Nelkin, 1995; Stocking, 1999). And although Blum's text in a critical way does allow more disparate perspectives than the other two, not even this article gives the impression that any other actors than researchers are qualified to express a view on the research on the causes of violent behaviour. Apart from Stolberg's reference to an invisible and emotional "mass", non-experts are only present in the texts as an implied audience, partly positioned in the role of pupils.

In a field as uncertain and controversial as this one, it is striking that two of the texts almost exclude and largely discredit oppositional voices and views. When Kotulak and Stolberg both link oppositional voices (indirectly or directly) to "sociologists" or "sociology", it is tempting to read these texts as typifying Nelkin & Lindee's claim that there is a tendency in media accounts to highlight the importance of biology and genetics when they report on conditions that could lead to violence (1995, p. 89). In this way, Kotulak's and Stolberg's texts also indicate a tendency that is identified in studies of the media's coverage of another area, environmental risks: the media process certain 'expert' voices as being self-evidently 'authoritative' while simultaneously framing oppositional voices as lacking 'credibility' (Allan, Adam, & Carter, 2000, p. 16).

The lack of multiperspectivity in these articles may have to do with the need to give the topic a certain direction and focus, something that presumably becomes all the more significant when complex research material is to be presented so that it engages and is understood by many readers.

However, my analysis has tried to show how Blum's text does make science speak with more than one voice about this uncertain, controversial and emergent field of research. Thus, in accordance with Dunwoody's aforementioned thesis, I choose to read Blum's text as displaying somewhat larger journalistic control over how this research is to be understood and interpreted in public. The two other texts appear as more respectful and unreserved in their representation of "the biology of violence" and actors involved in this research.

Taking Nelkin's (1995) claim about the *homogeneity* of science journalism[9] into consideration, I suggest that a discourse analytical approach will display differences between texts to a greater degree than approaches that investigate a larger corpus (e.g. content analysis, which is frequently used in media studies, also of science journalism - see Hornmoen, 2003). With its close attention to linguistic details, the analysis can exhibit more clearly than other approaches how relations and perspectives are constructed in news articles.

My analysis has indicated how use of language in apparently multiperspectival science reporting reproduces particular ways of seeing and power relations. By applying CDA, I have suggested how even articles that include several voices (Kotulak, Stolberg) and different parties' views (Stolberg), advocate specific knowledge claims and ways of seeing. The analysis has also displayed a representation of uncertain science that is more "multiperspectival" (Blum), and thus may invite the reader to reflect upon how scientific knowledge is contingent on contextual conditions. In this way, I have hopefully demonstrated that there are other ways of representing uncertain scientific knowledge, modes that may be indicative of a more dialogical and deliberative news coverage of science.

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[9] In her seminal Selling Science, Nelkin claims that in science journalism "most articles on a given subject focus on the same issues, use the same sources, and interpret the material in similar terms" (Nelkin, 1995, p. 9).

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