How Reading Goals and Rhetorical Signals Influence Recipients' Recognition of Intertextual Conflicts

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Abstract

Becoming aware of conflicting information is an integral part of comprehending multiple documents on a scientific issue. We examined whether memory for conflicts and its application in an essay task could be enhanced by a combination of reading goals and text signals. Two high-coherence-orienting reading goals (reading to write a summary or an argumentation) were contrasted with a low coherence-orienting goal (composing a list of key words). Moreover, for half of the participants texts contained rhetorical connectors signaling the existence of conflicts, whereas the other half did not. A total of 184 undergraduates read multiple documents on a controversial medical issue. As expected, reading with high-coherence goals facilitated conflict recognition more than a low-coherence goal. The facilitative effect of signaling was particularly pronounced in the summary group. Moreover, participants in the signaling-condition and in the high-coherence goal conditions wrote the most integrated essays subsequent to reading.

Keywords: multiple document literacy; reading comprehension; reading online; task effects; signaling

Introduction

Comprehending multiple documents on a scientific issue is a common task in modern information societies. Especially with the advent of the internet as today's primary resource of scientific information, accessing a variety of heterogeneous documents with a specific goal in mind has become a frequent reading situation. This holds both for informal learning (e.g., when laypersons conduct an internet search to support a knowledge-based decision) and for institutionalized learning contexts, such as in school or university settings (e.g., when searching a variety of online-documents to complete a task assignment).

However, scientific information is usually tentative and evolving in nature and authors frequently disagree on at least some points of a scientific issue. Hence, we contend that becoming aware of conflicts between sources is an integral part of comprehending scientific information from multiple documents. This presupposes that readers do not treat the texts they read as isolated chunks of information. Rather, they have to integrate information across documents trying to establish cross-textual coherence. This, however, can be a major cognitive endeavor (Wineburg, 1991). Whereas within-text integration is usually facilitated by the author, e.g. through presenting arguments in an orderly fashion or by using linguistic devices to disclose the relationship between ideas, the responsibility of establishing cross-textual coherence mainly resides with the reader. Previous research gives rise to some skepticism about the mastery of the skills required to comprehend multiple documents by readers of different age levels (Wineburg, 1991). Therefore, it is both of practical as well as of theoretical importance to identify factors that lead readers to establish strong intertextual connections.

Against this background, the present study aimed to broaden our understanding of multiple document comprehension by examining the joint effects of two factors that are supposed to enhance a reader's ability to integrate conflicting information from multiple sources: the goals a reader adopts and rhetorical connectors, which signal intertextual relationships.

The Influence of Reading Goals on Text Comprehension

Until now, only a few studies have investigated the influence of reading goals on the processing of multiple documents. In the context of single text comprehension, however, reading goals have been identified as one of the most influential determinants of text processing (McCrudden & Schraw, 2007). Reading goals activate mental schemata, which provide readers with guidance in determining which chunk of information may be most relevant and thus should be incorporated into the macrostructure of a text representation (McCrudden & Schraw, 2007). With respect to multiple documents comprehension, reading goals might be especially influential because they additionally serve as a frame of reference when readers decide which level of coherence is needed in terms of a functionally adequate text representation (Tapiero, 2007). That means that depending on their respective task, readers decide whether they are satisfied with forming local coherence (e.g., at the level of a single paragraph in simple fact-finding tasks) or whether they seek to establish global coherence, including intertextual relationships. The preliminary evidence available suggests that to accomplish global coherence at the intertextual level, tasks are beneficial that require students to connect different units of information (e.g., Bråten & Strømsø, 2010; Cerdán & Vidal-Abarca, 2008; Rouet, Vidal-Abarca, Erboul, & Millogo, 2001; Wiley & Voss, 1999). Especially the task of reading to write an argumentation has proven to promote processes of comparing and integrating information across sources (Bråten & Strømsø, 2010; Cerdán & Vidal-Abarca, 2008;

Wiley & Voss, 1999). This fosters the formation of a highly integrated mental representation of the contents readers are dealing with, while at the same time prompting readers to spot differences in the argumentations of different authors. In addition, Gil, Bråten, Vidal-Abarca, and Strømsø (2010) demonstrated that the somewhat less demanding task of reading to write a summary can be at least equally beneficial, especially for readers with low prior knowledge. This may be because writing a summary also orients reader toward establishing global coherence, requiring them to form a generalized macrostructure out of contents integrated from different sources.

However, until now, the question of whether reading goals influence the comprehension and integration of *conflicting* information has not been sufficiently investigated. In most of the aforementioned studies, information that had to be integrated complemented one another. Hence, the question as to whether readers become aware of intertextual conflicts was not at the core of previous studies. This difference is not trivial, because research has revealed that readers expecting a more or less consistent discourse often hesitate to accept conflicts and do not integrate them into their mental representation, accordingly (Otero, 2002). Hence, the task of integrating conflicting information may be even more demanding for readers compared to the integration of undisputed information. Thus, the first aim of our study was to fill this gap and extend our knowledge about the role of reading goals in multiple document comprehension to the comprehension of conflicting scientific information.

The Influence of Rhetorical Connectors on the Comprehension of Conflicting Information

In addition to contextual factors, such as reading goals, factors on the side of the text are likely to exert an influence on readers' propensity to integrate information across texts. For instance, Perfetti (1997) argued that signaling the rhetorical structure to readers through rhetorical connectors, such as "in contrast to" or "in line with", should facilitate forming a mental representation of intertextual relationships. Conversely, to the extent that linguistic markers are missing, readers have to infer intertextual relationships without the author's explicit support. Research on comprehending single documents has indeed shown that text signals, such as headings, exert a strong influence on readers' text processing, and the related text comprehension products (e.g., Hyönä, Lorch, & Kaakinen, 2002). According to the theory of signaling put forward by Lemarié, Lorch, Eyrolle, and Virbel (2008), however, signaling effects on text-processing should depend on the relevance of the signaled information to the readers' goals. That is why we assume that rhetorical connectors should be particularly influential when readers pursue the goal to establish intertextual connections.

Hence, the second aim of our study was to examine the effect of linguistic markers explicating the rhetorical structure between authors' arguments on the comprehension of conflicting multiple documents. More specifically, we sought to find out whether such an effect would depend on the reading goal pursued by a recipient.

The Present Study

Given this theoretical orientation, we set out to contrast two reading goals that have a strong focus on global coherence formation (reading to write a summary/ reading to write an argumentation) with a reading goal that only requires to form local coherence (reading to create a list of key words that can be used as social tags). The latter task should cause readers to focus more on single words at the text surface without devoting attention to macro-structural argument chains and cross-textual differences.

Our hypothesis was that readers are better at detecting intertextual conflicts when reading to write an argumentation and reading to write a summary compared with reading to compose a list of key words. The advantage of the two high coherence-orienting reading goals over the low coherence-orienting reading goal of composing a list of key words should also be observable in a written essay, in which readers are required to communicate their knowledge about intertextual conflicts.

Against the background of the reviewed research, we furthermore explored whether reading to write an argumentation would lead to a better detection of intertextual conflicts than pursuing a summary task. This hypothesis is motivated by the assumption that in addition to causing readers to focus on the formation of global coherence, an argumentation task more directly requires readers to identify inconsistencies between different accounts of the same situation.

Furthermore, we expected a beneficial effect of signaling conflicts through rhetorical connectors in terms of conflict detection. Rhetorical connectors that signal intertextual conflicts should primarily affect conflict detection in readers who pursue coherence-oriented reading goals. The facilitative effect of rhetorical connectors should be less pronounced when readers pursue a low coherence-oriented reading goal, for which information about conflicts should be less relevant.

Method

Participants and Design

One hundred eighty-four undergraduates with different majors at a German university participated in the study (67% female, mean age = 22.99 years, *SD* = 3.68). Four outliers, whose values on the dependent variables exceeded a critical distance of 2.5 *SD* from the respective group mean, were dropped from analyses to rule out their distorting effect on statistics (Tabachnick & Fidell, 2001). This left us with a sample of 180 participants (67% female, mean age = 23.07 years, *SD* = 3.68). To ensure participants' lay status, a prior knowledge test about the topic of the documents to be read (cholesterol) was administered before reading; none of

the participants answered more than 60% of the questions correctly.

Participants were randomly assigned to one of six experimental groups following a three (reading goals) * two (signaling) between-subjects design. They were instructed to read either in order to write (1) an argumentation, (2) a summary or (3) a list of key words.

Text Materials

Nine websites that revolved around the topic cholesterol were presented as the homepages of different medical doctors and were accessible on a computer screen via a list of hyperlinks. Documents were controlled for length (M = 309 words, SD = 11.28), comprehensibility, credibility and perceived author expertise. In sum, six of the documents contained three intertextual conflicts, each of which consisted of two opposing claims. Each claim was only mentioned in one of the documents. The conflicts dealt with the questions (a) whether there is a unitary threshold value for cholesterol, (b) whether high cholesterol can be lowered with a certain group of drugs called statins and (c) whether separate values for HDL and LDL are reliably indicated by a quick test. The rest of each document comprised non-conflicting and non-redundant information; the three remaining documents contained only filler information.

In the signaling conditions, the conflicting claims were introduced by rhetorical connectors signaling the existence of an opposing stance. For instance, one of the sources contained the claim: "In contrast to what some health professionals hold, the cholesterol level can be lowered with statins." (NB there was no underlining in the original materials). The claim was contradicted by another source: "Contrary to what some health professionals argue, statins cannot lower the cholesterol level."

Covariates

To be able to trace back differences in comprehension unequivocally to our experimental manipulation, we decided to control for the potential effects of a series of reader-related variables that have been shown to be influence learning from (electronic) texts in previous research. We ascertained data on participants' interest in the topic cholesterol (measured with a self-developed three-item questionnaire, Stadtler, 2006), participants' need for cognition (Bless et al., 1994), need for cognitive closure (Webster & Kruglanski, 1994) and epistemic beliefs regarding the domain medicine (Stahl & Bromme, 2007) (all Cronbach's alphas ranging from .53 to .91). Furthermore, we assessed participants' topic knowledge prior and subsequent to reading the text materials, with a 9-item multiple choice test on the topic cholesterol (Cronbach's alpha = .48).

Dependent Variables

Intertextual conflict verification task (ICVT) To measure the extent to which participants represented the given intertextual conflicts, an intertextual conflict verification task was administered. In total, the test consisted of 48 items, which were (a) two paraphrases for each text-proposition that stood in conflict with a proposition from another text (resulting in 12 items, $\alpha = .76$), (b) paraphrases of text-propositions that were not in conflict with a proposition from any other text (12 items, $\alpha = .62$), (c) propositions on the topic of cholesterol, that were not included in the set of documents, but stood in conflict with one of the text propositions (12 items, $\alpha = .75$) and finally (d) propositions on the topic of cholesterol that were neither included in the set of documents nor stood in conflict with any one of the text propositions (12 items, $\alpha = .63$). Each item consisted of two questions which required participants to indicate both whether the set of documents contained the given stimulus item, and whether it contained a proposition that stood in conflict with the given proposition. Participants only received a point, if they answered both questions correctly. A coefficient of memory for conflicting information was calculated by subtracting the proportion of false positives (calculated from type (b) and type (c) paraphrases) from the proportion of correctly answered type (a) items. Thus, the resulting index reached from -1 to 1, with the value 1 indicating a perfect detection performance.

Application of knowledge about conflicting information in a communication task After the reading phase, all participants (i.e. independent from their initial reading task) were asked to write an essay to a fictitious friend who has been diagnosed with a high cholesterol level. In this essay, participants should indicate whether or not they would recommend their friend to lower his or her cholesterol level and to give reasons for their decision. The essays were analyzed in terms of how participants applied their knowledge about the controversiality of information to inform their friend.

(1) Content analysis. For each essay it was determined whether participants explicitly informed their friend about the fact that the received information was conflicting by either referring to one or more specific conflicts or by labelling the information as generally conflicting. Explicit referrals were coded in a dichotomous variable. Twenty percent of the essays were coded by two independent raters; interrater-agreement was excellent (Cohen's Kappa = .913, $p < .001$).

(2) Linguistic analysis. Furthermore, essays were analyzed for the presence of rhetorical connectors used to express textual relationships of two types: contrariness (e.g., *however, in contrast*) or coherence (e.g., *likewise, similarly*). In selecting the rhetorical connectors, we drew on Pasch (2003) who presented a comprehensive list of connectors for the German language. Higher numbers of rhetorical connectors in participants' essays were supposed to be indicative of a more pronounced approach to present the information in an integrated fashion.

Navigation patterns Logfiles of navigation patterns were recorded to provide insights into the effects of reading goals and rhetorical connectors on a process level. Navigation patterns were analyzed in terms of (1) the degree of sequentiality of reading behavior (number of transitions between any documents that followed one another in the list of hyperlinks qualified by the total number of documents accessed) and (2) length of navigation paths (total number of documents accessed) indicating participants' attempts to create coherence through re-reading the materials.

Procedure

The main data collection took place in group sessions with a maximum of eight participants, who worked individually with a laptop. To prevent spill-over effects from elaborating on the nature of medical knowledge to the way participants approached the documents to be studied, epistemological beliefs had been assessed via an online questionnaire at least two days prior to the main data collection. During the main session, participants first completed measures of the remaining control variables. Afterwards, participants were introduced to their respective reading assignment and started reading for which they had 20 min. Log files of the reading process were collected. Participants were reminded of their respective reading goal after 10 and after 15 min had elapsed. After 20 min, the experimenter terminated the reading phase. Reading time was fixed in order to avoid time-on-task effects. Afterwards, participants completed the essay task, which was followed by the ICVT. Finally, participants completed the same topic knowledge test that had already been administered before reading.

Results

Covariates

ANOVAs revealed that the experimental groups did not differ regarding topic interest, need for cognition, need for cognitive closure, epistemological beliefs and prior topic knowledge (all $Fs \leq 2.20$, *ns*). As a consequence, all covariates were dropped from further analyses.

Memory for Conflicting Information (ICVT)

To test our assumption regarding the influence of reading goals on memory for conflicting information, we conducted planned contrasts. Results revealed a significant but small difference between the argumentation group and the key word group, $F_{(1, 174)} = 5.83$, $p = .017$, $\eta^2_{part} = .032$. Readers instructed to read in order to later write an argumentation remembered conflicting information better than readers who read to create a list of key words (see Table 1).

Furthermore, the summary group performed better than the key word group, $F_{(1, 174)} = 4.00$, $p = .047$, $\eta^2_{part} = .022$, whereas no significant difference was found between the argumentation group and the summary group, $F_{(1, 174)} = .157$, *ns*.

Table 1: Means and standard deviations (in brackets) of memory for conflicting information as a function of reading goal and signaling.

	Argumentation	*Summary*	*Key words*
Signaling	.31 (.32)	.36 (.35)	.22 (.25)
No signaling	.24 (.28)	.15 (.25)	.09 (.15)

We also tested the assumption that signaling through rhetorical connectors would have a beneficial effect on memory for conflicting information, which should be less pronounced or non-existent among readers with a low coherence-orientation. Planned contrasts, comparing each reading goal with and without rhetorical connectors, yielded a significant effect of rhetorical connectors among those participants who read in order to write a summary, $F_{(1, 174)} = 8.08$, $p = .005$, $\eta^2_{part} = .044$. Readers of texts with rhetorical connectors outperformed readers who were not provided with rhetorical connectors. However, there was no significant difference between argumentation readers with and without rhetorical connectors, $F_{(1, 174)} = 1.21$, *ns*. Finally, the presence of rhetorical connectors did only marginally improve memory for conflicting information among readers with a key word goal, $F_{(1, 174)} = 3.73$, $p = .055$, $\eta^2_{part} = .021$.

Application of knowledge about conflicting information in a communication task

Due to technical error, essays from five participants could not be collected.

(1) Content analysis: To test whether reading goals and signaling of rhetorical relationships exerted an influence on readers' inclination to explicitly refer to the conflicting nature of information, a three-way hierarchical log-linear analysis with backwards elimination was calculated. The second order effect of rhetorical connectors and conflict explication was significant, likelihood ratio $\chi^2_{(5)} = 27.554$, $p < .001$. None of the further second or third order interactions reached significance and they were thus excluded from the final regression model. The descriptive statistics depicted in Table 2 reveal that more essays contained explicit references to the conflicting nature of information when rhetorical connectors were available (42%) than when they were not available (12%).

Table 2: Number of essays containing explicit references to conflicting information per experimental group; number of essays without references is given in brackets.

	Argumentation	*Summary*	*Key words*
Signaling	15 (15)	14 (16)	8 (21)
No signaling	4 (27)	3 (25)	3 (24)

(2) Linguistic analysis: To determine the influence of reading goals and signaling of rhetorical relationships on the

degree of information integration observed in readers' essays, we calculated a mixed ANOVA. Reading condition and signaling served as independent factors and type of connector (agreement vs. contradiction) as a repeated measure. Results yielded a significant effect of type of connector, $F_{(1, 168)} = 8.09$, $p = .005$, $\eta^2_{part} = .046$. Across conditions, participants used more connectors expressing contradiction ($M = 2.62$, $SD = .15$) than connectors expressing agreement ($M = 2.09$, $SD = .12$), a result certainly reflecting the conflicting nature of the materials readers had to deal with. Moreover, a significant effect of signaling showed that participants who read texts with rhetorical connectors structured their essays with a higher number of rhetorical connectors than their counterparts without rhetorical connectors, $F_{(1, 168)} = 11.33$, $p = .001$, $\eta^2_{part} = .063$. Finally, an effect of reading goal on the use of rhetorical connectors was obtained, $F_{(2, 168)} = 9.57$, $p < .001$, $\eta^2_{part} = .102$. Planned contrasts showed that this was due to both the argumentation group ($F_{(1, 168)} = 16.20$, $p < .001$, $\eta^2_{part} = .088$) and the summary group ($F_{(1, 168)} = 12.49$, $p < .001$, $\eta^2_{part} = .069$) structuring their essays with a higher degree of connectors than the key word group. No difference was observed between the argumentation group and the summary group, $F_{(1, 168)} = .19$, *ns*.

Navigation Path Measures

Logfiles could not be recorded from eight participants due to technical error.

(1) Degree of sequentiality of reading behavior: An ANOVA with the number of sequential transitions qualified by the total number of texts accessed as dependent variable yielded a significant effect of reading condition, $F_{(2, 166)} = 8.54$, $p < .001$, $\eta^2_{part} = .093$. Participants reading to compose a list of key words showed a higher degree of sequential transitions than participants in the summary group, $F_{(1, 166)} = 16.33$, $p < .001$, $\eta^2_{part} = .090$. No significant difference was found between the argumentation group and the key word group, $F_{(1, 166)} = 1.65$, *ns*.

(2) Length of navigation paths: The length of navigation paths was strongly affected by reading goal, as indicated by an ANOVA, $F_{(2, 166)} = 71.04$, $p < .001$, $\eta^2_{part} = .461$. Participants in the key word group displayed a lower degree of re-reading than participants in the summary group ($F_{(1, 166)} = 108.54$, $p < .001$, $\eta^2_{part} = .395$) and in the argumentation group ($F_{(1, 166)} = 104.87$, $p < .001$, $\eta^2_{part} = .387$).

Discussion

With the present study, we sought to identify factors that determine whether readers with little prior knowledge successfully derive meaning from a set of internet documents on a controversial medical topic. We accomplished this by simultaneously examining the effects of coherence-oriented reading goals and textual devices cueing the presence of textual conflicts on the understanding of conflicting scientific information. Comprehension was operationalized as memory for intertextual conflicts and application of this knowledge in a written essay composed after reading.

In line with our expectations both the argumentation group and the summary group outperformed readers in the key word group. However, no difference was found between recipients who read in order to write an argumentation and those who were instructed to write a summary. Possibly, readers in the argumentation group did not translate their reading task into strategies of intertextual integration to the degree we had expected due to time restrictions. The 20 minutes of reading time provided may have been too short for laypersons to gain a basic understanding of the central concepts at hand, relate them to one another and form an own opinion. This result is in line with the findings reported by Gil et al. (2010), who argued that argumentation tasks may not live up to their full potential until a sufficient level of prior knowledge is available and thus yield results comparable with those accomplished by summary tasks.

Furthermore, we obtained a clear effect of rhetorical connectors among participants who read in order to write a summary. This effect was also present but less pronounced among readers in the key word group. The fact that participants reading to compose a simple list of key words also benefitted at least to some degree from the presence of rhetorical connectors underlines the power of this rhetorical device as a tool to highlight intertextual relationships. Hence, rhetorical connectors might compensate for a lack of an a priori focus on the intertextual space. Unexpectedly, we did not find a beneficial effect of rhetorical connectors in the argumentation group either. This was because the argumentation group already displayed a rather good performance even without rhetorical connectors. Presence of rhetorical connectors did not significantly raise performance over and above this spontaneous level of conflict detection.

Analyses of the essays produced by our participants largely corroborate the aforementioned results. Readers of texts with rhetorical connectors more frequently produced essays containing explicit references to the conflicting nature of information. Moreover, these readers structured their essays themselves with a higher number of rhetorical connectors. No effect of reading goal on explicit conflict referencing was obtained, but participants in both coherence-oriented reading groups used more rhetorical connectors than participants of the key word group.

Finally, navigation data provided us with insights into the effects of reading goals on a process level. Participants in the coherence-oriented reading conditions accessed a significantly higher number of texts within the same time limit. They thus showed a higher degree of re-reading specific texts, which can be understood as an attempt to create cross-textual coherence. This strategy might enable readers to reactivate information in working memory that has been read before and to relate it to information currently being held active in working memory. Readers in the key

word condition pursued a different strategy. They spent more time on each text and read in a highly sequential order with little re-reading. This allowed them to scrutinize each single document, find key words and even gain factual knowledge. However, as shown by a poor detection of intertextual conflicts, this strategy obviously did not foster the mental representation of intertextual relationships.

In summary, our results support the notion that one precondition to successful cross-textual integration is that readers pursue the goal of forming a coherent representation across texts. In contrast, more functional reading goals, such as composing a list of key words, appear not to support integration processes on an intertextual level. Only when pursuing reading goals that require a high degree of coherence formation did readers successfully detect intertextual conflicts. Participants reading for the goal of composing a list of key words, however, confined themselves to form coherence on a rather local level. This allowed them to gain factual knowledge but did not foster the formation of intertextual relationships.

Furthermore, our results indicate that reading goals have an additional indirect influence on readers' success in identifying intertextual conflicts, by affecting the relevance that is assigned to signaling text features: Rhetorical connectors particularly facilitated awareness of intertextual conflicts when readers pursued a goal that required them to form a high level of coherence. This finding can be interpreted as providing further evidence for the notion that successful comprehension is based on an interaction of strategic top-down on the side of the reader and processes that are text-driven (Kurby, Britt & Magliano, 2005).

The goals adopted by readers are of utmost importance when reading multiple, partly conflicting documents, since they form the basis of all further text-processing. By determining the relevance of specific text features, reading goals have a particularly strong impact on cross-textual integration when combined with text signals indicating the relationship between documents.

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