Who Said That? Investigating the Plausibility-Induced Source Focusing Assumption with Norwegian Undergraduate Readers

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Abstract

The present study investigated to what extent encountering a textual claim that contradicts one's prior beliefs may increase readers' memory for the source of the information, such as the author or publication. A sample of 71 Norwegian economics and administration undergraduates were presented with texts on cell phones and potential health risks that either concluded that cell phones involve serious health risks or that they are perfectly safe. Results showed that readers' memory for source feature information increased when the conclusion of the text contradicted the belief that cell phone use poses serious health risks but not when it contradicted the belief that cell phone use does not involve such risks. This is partly consistent with the Plausibility-Induced Source Focusing assumption recently proposed by de Pereyra, Britt, Braasch, and Rouet (2014), suggesting that when readers judge content information to be implausible in light of their prior beliefs on the topic, they may be more likely to seek support from available information about the source to make sense of the content.

Keywords: Reading literacy; Source memory; Discrepancy; Plausibility.

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1. Introduction

Reading literacy researchers interested in how students deal with textual information concerning controversial issues have revealed that even at secondary and undergraduate levels, students more often than not disregard source information and pay attention only to the content of the texts (Bråten, Strømsø, & Andreassen, in press; Britt & Aglinskas, 2002; Gerjets, Kammerer, & Werner, 2011; Maggioni & Fox, 2009; Stadtler & Bromme, 2007; Stahl, Hynd, Britton, McNish, & Bosquet, 1996; von der Mühlen, Richter, Schmid, Schmidt, & Berthold, in press; Wineburg, 1991). This is especially problematic in the 21st century reading context, where the abundance of easily accessible information of dubious quality requires that readers more than ever are capable of critically evaluating the sources they encounter (Alexander & the Disciplined Reading and Learning Research Laboratory, 2012; Bråten, Stadtler, & Salmerón, in press; Brand-Gruwel & Stadtler, 2011; Leu, Kinzer, Coiro, Castek, & Henry, 2013; Stadtler, Bromme, & Rouet, 2014). Accordingly, the importance of focusing on source features (e.g., the author, publication, and date and type of publication) during reading is highlighted in several current conceptualizations of reading literacy, including the new literacy framework of Leu et al. (2013) and the documents model framework of Britt and colleagues (Britt, Rouet, & Braasch, 2013). Essentially, the assumption underlying these conceptualizations is that by attending to source feature information in addition to content, readers will be able to form source-source and source-content links that allow them to compare sources and judge the trustworthiness of the content in light of the characteristics of the sources (see also, Bråten & Strømsø, 2012). In this way, taking source information into consideration will also help readers assign proper weight and

position to a particular message when trying to construct a mental representation of a controversial issue.

Consistent with theoretical assumptions, recent empirical work has shown that readers' attention to and memory for source information relate to their text-based learning and comprehension (Anmarkrud, Bråten, & Strømsø, 2014; Barzilai & Eshet-Alkalai, 2015; Barzilai, Tzadok, & Eshet-Alkalai, 2015; Bråten, Strømsø, & Britt, 2009; Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012; Strømsø, Bråten, & Britt, 2010; Wiley et al., 2009), with recent intervention work (Braasch, Bråten, Strømsø, Anmarkrud, & Ferguson, 2013; Macedo-Rouet, Braasch, Britt, & Rouet, 2013; Mason, Junyent, & Tornatora, 2014; Stadtler, Scharrer, Macedo-Rouet, Rouet, & Bromme, 2016; Walraven, Brand-Gruwel, & Boshuisen, 2013; Wiley et al., 2009), in particular, strengthening the idea that readers' consideration of source feature information actually promotes learning and comprehension of textual information.

Rather than launching yet another investigation of how sourcing activity can be increased through systematic intervention, however, the current study focused on how characteristics of the reader and the text might interact to facilitate or constrain students' memory for source information. Specifically, we built on the Plausibility-Induced Source Focusing assumption of de Pereyra, Britt, Braasch, and Rouet (2014) and examined whether a discrepancy between readers' preexisting beliefs about the topic of the text and the message conveyed by the text would increase readers' attention to source information during reading, as indicated by their source memory performance. In addition, with most prior work examining students' attention to source information when reading multiple texts (e.g., Anmarkrud et al., 2014; Bråten et al., 2009; Britt & Aglinskas, 2002; Goldman et al., 2012; Stahl et al., 1996; Strømsø et al., 2010; von der Mühlen et al. in press; Wiley et al., 2009; Wineburg, 1991), this is one of the very few studies targeting sourcing when students read

single rather than multiple texts (see, however, Braasch, Rouet, Vibert, & Britt, 2012; Bråten, Strømsø, et al., in press; de Pereyra et al., 2014; Steffens, Britt, Braasch, Strømsø, & Bråten, 2014). Before specifying the rationale and the hypothesis for the current empirical work, we also briefly discuss the particular theoretical assumptions underlying our study as well as the most relevant prior work building on those assumptions.

1.1 Theoretical assumptions and prior research

The Plausibility-Induced Source Focusing assumption (de Pereyra et al., 2014) can be considered an extension of the Discrepancy-Induced Source Comprehension assumption of Braasch et al. (2012). In a seminal paper, Braasch et al. (2012) launched the idea that readers' attention to source information (i.e., to "who said what") might increase when different sources provide discrepant accounts of a situation. Specifically, these authors proposed that when different sources make conflicting claims about a controversial situation or issue, one mechanism for resolving the resulting break in situational coherence (Graesser, Singer, & Trabasso, 1994) and constructing an integrated mental representation may be to link discrepant content information to the respective sources. Referring to this assumption as the Discrepancy-Induced Source Comprehension or D-ISC assumption, Braasch et al. (2012) provided preliminary evidence in two experiments where students read brief news reports containing two claims that were either conflicting or consistent. In accordance with the D-ISC assumption, online and offline data, respectively, indicated that conflicting claims promoted deeper processing of and better memory for the sources of the claims, as compared to consistent claims. Of note is that in the Braasch et al. (2012) study, the conflicting claims and their respective sources were embedded in a single text (i.e., a brief news report). However, the D-ISC assumption has also received empirical support in reading contexts where conflicting claims about the same issue are presented in multiple distinct texts (Kammerer & Gerjets, 2014; Kammerer, Kalbfell, & Gerjets, 2016; Salmerón, Macedo-Rouet, & Rouet, in

press; Stadtler, Scharrer, Skodzik, & Bromme, 2014; Strømsø & Bråten, 2014; Strømsø, Bråten, Britt, & Ferguson, 2013).

For example, Kammerer and Gerjets (2014) found that conflicts between the claims of an institutional web page and several other, partly commercial, web pages on a controversial fitness-related issue made readers allocate more attention to the source of the institutional web page during reading and include more source citations in their written summaries. In the same vein, Stadtler, Scharrer, et al. (2014) found that when the existence of conflicting claims across multiple texts on a controversial health issue was explicitly signaled through rhetorical means, students included more source citations when generating essay responses on the issue from memory. In contrast, Steffens et al. (2014), who had undergraduates read single texts on controversial health issues that contained inconsistencies or consistencies between claims and arguments, did not find that source information was recalled any better when such within-text inconsistencies were presented. In keeping with Stadtler, Scharrer, Brummernhenrich, and Bromme (2013), one reason for this may be that students are less likely to attend to and remember conflicting views and inconsistencies when they are included in single texts compared to across texts. Moreover, readers may have encountered difficulties using the source when trying to resolve the coherence breaks because the sources of the single texts designed by Steffens et al. (2014) were all experts (i.e., medical doctors) and, as such, less helpful in comprehending the inconsistencies (e.g., by attributing claim – evidence inconsistencies to lack of competence or bias).

Recently, de Pereyra et al. (2014) proposed the Plausibility-Induced Source Focusing assumption, which is an extension of the D-ISC assumption to situations involving discrepancies between readers' prior knowledge and textual information. In such situations, textual information may be considered less plausible, with plausibility defined as a "judgment on the relative potential truthfulness of incoming information compared to our existing mental

representations" (Lombardi, Sinatra, & Nussbaum, 2013, p. 50). Presumably, plausibility judgments may be automatically made during reading (Isberner & Richter, 2013; Richter, Schroeder, & Wöhrmann, 2009); yet, in some instances, readers may also intentionally control their plausibility judgments and critically (re)consider claims at odds with their preexisting mental representations (Chinn & Brewer, 2001; Lombardi et al., 2013; Maier & Richter, 2014). In any case, source feature information may be assumed to function as facilitative additional cues when readers try to make sense of claims judged to be less plausible because they are discrepant with their prior knowledge (de Pereyra et al., 2014). Accordingly, Lombardi, Seyranian, and Sinatra (2014) theorized that when plausibility is judged to be low, readers may rely on source features to make sense of the message instead of effortfully processing the content information.

Of note is that the Plausibility-Induced Source Focusing assumption differs from the D-ISC assumption in that the former concerns discrepancies between textual claims and the latter concerns discrepancies between textual claims and readers' prior mental representations. Thus, while the sources of the conflict reside within the text(s) in the first case, one of those sources is the reader in the latter. In both cases, however, it can be assumed that the discrepancies create a break in the situational coherence that is necessary for understanding (Graesser et al., 1994), with an increased attention to source information being one potential mechanism for restoring such breaks. Moreover, in both cases, readers may try to resolve the resulting breaks in coherence by integrating or reconciling discrepant views (viz., within-text discrepancies and text-reader discrepancies), or by preferring one particular view (cf., Stadtler & Bromme, 2014). Thus, in some instances, source information may help readers understand conflicts and reconcile the different views; in others, it may help them take (or retain) a particular stance on the issue.

In testing the Plausibility-Induced Source Focusing assumption, de Pereyra et al. (2014) conducted two experiments where university students read brief news stories that contained implausible or plausible information in light of readers' prior world knowledge, with this information conveyed by sources embedded within the stories (e.g., in one story, astronauts conveyed the implausible information that a space station was equipped with a bowling alley and a Jacuzzi). However, contrary to their expectations, neither experiment showed any effect of the plausibility manipulation on participants' memory for the sources. In accordance with de Pereyra et al. (2014), we suggest that this lack of effects might be due to the fact that readers did not really need any support from source information to make sense of the implausible claims but, given their simple and obvious discrepancy with common world knowledge, could reject them right away based on the content information alone. Further research on the Plausibility-Induced Source Focusing assumption should therefore use more complex text materials than the short news-like pieces used by de Pereyra et al. (2014), presumably making it harder to base one's evaluation of a claim on the sole content of a text without taking any source feature information into consideration. In addition, the current study extended this line of research by presenting a written claim that was discrepant or consistent with the reader's prior beliefs or attitudes about the issue in question rather than with their prior knowledge.

Definitions of both knowledge and beliefs vary quite widely, and the distinction between the two constructs is not clear-cut (Murphy, Alexander, & Muis, 2012; Murphy & Mason, 2006; Southerland, Sinatra, & Mathews, 2001). Rather, knowledge and beliefs can be considered partly overlapping constructs (Murphy & Mason, 2006). In the present study, we followed Murphy and Mason's (2006) attempt to disentangle the two constructs by using knowledge to refer to what individuals accept as true that can be externally verified and confirmed by others interacting with the object, and beliefs to refer to what individuals accept

as or want to be true regardless of verification. It is also pertinent to the present study that beliefs can be characterized by being more experiential (i.e., rooted in episodic memory) and by having higher levels of affect, evaluation, and personal importance, compared to knowledge (Andiliou, Ramsay, Murphy, & Fast, 2012; Eichenbaum & Bodkin, 2000; Kane, Sandretto, & Heath, 2002; Nespor, 1987; Pajares, 1992). In general, then, beliefs may seem to be more strongly associated with affective aspects of learning and less strongly associated with rational processes or "cold cognitive aspects of learning" (Brown, Bransford, Ferrara, & Campione, 1983). As a result of such differences, beliefs can also be conceived of as more difficult to alter than knowledge.

Classic as well as recent empirical research findings support that preexisting beliefs about particular topics may influence readers' recall, evaluation, and comprehension of textual information, with information consistent with readers' prior beliefs more likely to be recalled, evaluated positively, and included in their mental representations of situations and issues than belief-inconsistent information (Kahan et al., 2012; Kardash & Scholes, 1996; Lord, Ross, & Lepper, 1979; Maier & Richter, 2013, 2014; McCrudden & Barnes, in press; McCrudden & Sparks, 2014; Murphy & Alexander, 2004; Stanovich, West, & Toplak, 2013; Strømsø, Bråten, & Stenseth, in press; van Strien, Brand-Gruwel, & Boshuizen, 2014; Wiley, 2005). According to Maier and Richter (2014), the relationship between the beliefs individuals hold about a particular topic prior to reading and the claim or argumentative position in a controversy represented in a text may also be conceived of as a plausibility issue, with readers using their prior topic beliefs in validating the plausibility of incoming text information. A discrepancy between readers' topic beliefs and textual information may thus lead readers to devaluate the potential truthfulness of that information and, in accordance with the Plausibility-Induced Source Focusing assumption of de Pereyra et al. (2014), seek support from source feature information to make sense of the belief-inconsistent (i.e., implausible)

textual information, at least in situations where they perceive the discrepancy and encounter difficulty resolving it on the basis of content alone.

In a recent paper, Maier and Richter (2013) presented some findings consistent with the idea that a discrepancy between reader topic beliefs and textual information may trigger attention to the source of a text. Thus, when university students read two texts conflicting and two texts consistent with their prior beliefs on the topics of global warming or vaccination, these authors found that readers displayed better source memory for texts presenting arguments in conflict with their prior beliefs. Because source memory was indicated by readers' ability to associate paraphrases from the texts with the text titles, however, that study did not really provide any information about attention to source features (e.g., the author, publication, and date and type of publication) as a result of belief – text discrepancies. In the current study, we investigated this issue further by having students read single texts containing claims that were discrepant or consistent with their prior beliefs and assessing their memory for source feature information after reading.

Of note is that plausibility judgments may be influenced by several other factors in addition to the relationship between readers' preexisting mental representations and textual information (Lombardi et al., 2013; Lombardi, Nussbaum, & Sinatra, 2016). For example, in Lombardi et al.'s (2016) model of plausibility judgments in the context of conceptual change, plausibility is also influenced by information complexity, perceived conjecture, source credibility perceptions, and heuristic rules and biases. Still, de Pereyra et al. (2014) and Maier and Richter (2013, 2014), who also had participants rate the plausibility of textual information, showed that information inconsistent and consistent with prior world knowledge or topic beliefs is typically rated differently with respect to plausibility, with knowledge- and belief-inconsistent information perceived as less plausible than knowledge- and belief-consistent information. In the present study, we asked participants to rate their trust in the

belief-inconsistent and belief-consistent claims that they read. According to Lombardi et al. (2016), source credibility perceptions may be considered an antecedent to plausibility judgments.[1] Moreover, Lombardi et al. (2014) found that perceptions of author trustworthiness, as an aspect of source credibility, and plausibility perceptions were substantially correlated, with author trustworthiness being a unique predictor of plausibility and vice versa (in fact, plausibility was found to be a stronger unique predictor of author trustworthiness than the other way around). Presumably, perceptions of trust in textual claims may be even more strongly related to perceptions of plausibility than is trust in sources because the former concerns claims more directly.[2] In a recent study, Strømsø et al. (in press) also found that students trusted belief-inconsistent textual claims much less than belief-consistent textual claims. In other words, it seems reasonable to assume that belief-inconsistent textual claims are perceived as less plausible than belief-consistent textual claims, with readers' perceived trust in belief-inconsistent and belief-consistent claims varying accordingly.

1.2 The present study

This study represents a first attempt to test the Plausibility-Induced Source Focusing assumption with textual material that agrees with or opposes readers' prior topic beliefs by assessing readers' memory for source feature information after reading. Building upon Braasch et al.'s (2012) D-ISC model and supporting evidence from single- as well as multiple-text studies that discrepancies may trigger attention to sources (Braasch et al., 2012; Kammerer et al., 2016; Kammerer & Gerjets, 2014; Salmerón et al., in press; Stadtler, Scharrer, et al., 2014; Strømsø et al., 2013; Strømsø & Bråten, 2014), we followed de Pereyra et al. (2014) in assuming that the lack of plausibility could also increase memory for source features, with lack of plausibility in this study conceived of as a perceived discrepancy between readers' prior beliefs about the topic and textual claims (Maier & Richter, 2014).

Compared to knowledge, beliefs seem to be more strongly rooted in episodic memory, to have stronger affective and evaluative components, and to be more resistant to change (Andiliou et al., 2012; Eichenbaum & Bodkin, 2000; Kane et al., 2002; Nespor, 1987; Pajares, 1992). As a consequence, it may be less likely that readers will just revise their beliefs when encountering discrepant information (as might happen with prior world knowledge) and hence perceive the information as plausible. This also implies that because of the nature of beliefs, readers may often attend to sources to reject belief-inconsistent textual claims rather using them in the service of integrating or reconciling beliefs and discrepant textual claims.

Moreover, rather than presenting readers with simple stories where evaluations could be readily made on the basis of the content alone, we used more complex textual material on the controversial social-scientific issue of cell phone use and potential health risks, where readers presumably would find it difficult to (re)appraise plausibility on the basis of evidence presented in the content. In this context, readers may be more likely to seek support from source features in weighing the merits of the claim against their discrepant prior beliefs, with increased attention to source feature information, in turn, resulting in better source feature memory after reading. Specifically, on the basis of this we predicted an interaction effect of prior topic beliefs with textual claims on memory for source feature information, with improvements in source memory dependent on increases in the discrepancy between readers' topic beliefs and textual claims. Assuming a relationship between trust and plausibility (Lombardi et al., 2014, 2016), we asked participants to rate their trust in the textual claims that they read, with expected correlations between belief-text discrepancy and trust used to indicate the extent to which their plausibility perceptions varied with the discrepancy between their prior topic beliefs and the textual claims. Moreover, because readers' attention to source feature information may be related to their prior knowledge about the topic of the text (Bråten, Strømsø, & Salmerón, 2011; Rouet, Britt, Mason, & Perfetti, 1996), we included

participants' perceived knowledge or familiarity with the topic as a control variable to check whether the expected interaction between prior topic beliefs and textual claims occurred independent of this variable.

Finally, of note is that the current study contributes to the sparse literature on sourcing during single-text reading, as recently called for by Britt et al. (2013). According to Britt et al. (2013), readers may be less likely to separate source and content in single-text than in multiple-text contexts. When readers try to construct meaning from multiple texts on a controversial issue, they may be more likely to identify and mentally represent conflicting views on an issue than when reading about the same issue in a single text (Stadtler et al., 2013). In turn, representing conflicting views may promote greater attention to source information because readers need to qualify different views by linking them to their respective sources (Britt et al., 2013). Presumably, this increased attention to conflicting views and sources when reading multiple texts may also help readers note discrepancies between textual claims and sources on the one hand, and their own beliefs about the issue (and themselves as sources) on the other. That is, the attention to conflicting views and sources that may be triggered by the reading of multiple texts may also make discrepancies between textual claims and readers' beliefs more salient. Given the limited body of work on sourcing in single-text contexts, however, further research is particularly needed to better understand the salience of sources of single texts and how this may vary with individual and textual factors.

2. Method

2.1 Participants

Participants were 71 first-year students (52.1% women, 47.9% men) at a university college in south-east Norway with an overall mean age of 23.5 years (*SD* = 6.23) who attended a bachelor-level program in economics and administration. One participant was

excluded from the analyses due to missing data. The vast majority of the participants (73.2%) had Norwegian or another Scandinavian language as their first language and, at least in an international perspective, the sample was relatively homogeneous (i.e., middle class) in regard to socio-economic status. All participants had completed at least 12 years of schooling before starting in the economics and administration program. In addition, four participants had studied for one year after completing secondary school, and 13 participants had studied for two or more years after secondary school.

2.2 Materials

2.2.1 Topic belief measure

Participants' prior topic beliefs were assessed with a two-item inventory asking participants to rate their agreement with two statements concerning cell phones and health ("I believe that cell phone use can impair one's health" and "I do not believe that cell phone radiation can cause cancer" [reverse coded]) on a 10-point scale (1 = *not at all true*, 10 = *very true*). After having divided the scores by the number of items, the scores on the measure ranged from 1 to 10, with higher scores reflecting the belief that the use of cell phones involves serious health risk. The reliability estimate (Spearman-Brown coefficient) for scores on the topic belief measure was .92 (cf., Eisinga, Grotenhuis, & Pelzer, 2013). Because we addressed a single unitary theme (i.e., to what extent they believed cell phone use to involve serious health risk), we included only two items in this measure to avoid boredom and frustration on the part of the participants by repeatedly restating the same idea (cf., Dweck, Chiu, & Hong, 1995).

2.2.2 Perceived topic knowledge

As a proxy for *prior topic knowledge*, we used three items to assess participants' perceived knowledge of or familiarity with the topic discussed in the text. Thus, participants rated their knowledge about (1) how cell phones send and receive signals, (2) possible health

problems when using cell phones, and (3) how researchers investigate whether cell phone use might involve any health risk. On all items, participants rated their agreement with the knowledge statements ("I have knowledge about …") on a 10-point scale (1 = *disagree completely*, 10 = *agree completely*). Scores on the measure were divided by the number of items so that they ranged from 1 to 10. The internal consistency reliability (Cronbach's α) for participant scores on the perceived knowledge measure was .75. Of note is that prior research has found perceived knowledge to be a quite good indicator of students' scores on knowledge measures (Stanovich & West, 2008) and to play an important role in their judgments of new information (Andiliou et al., 2012).

2.2.3 Text

Each participant read one of two versions of a 379-word text discussing the controversial issue of whether cell phone radiation might have any negative health effects. The text was presented on a sheet of paper with the information that it was an article written by a named research reporter in a popular science magazine called The Illustrated Science, with the date of the publication provided in addition to this information about the author, the author's credentials, the publication, and the type of publication. The heading of the article read "Health effects of using cell phones", indicating that it contained information about a possible relationship between cell phones and health risks. The text consisted of four paragraphs. In the first paragraph, the issue was briefly introduced and readers were told that some people think that the use of cell phones may cause serious health problems, whereas others think that it is perfectly safe. The second paragraph explained in neutral terms how cell phones work. In the third paragraph, the text described different types of investigations that researchers conduct to clarify the issue of potential health risks (e.g., cohort studies, case-control studies, animal experiments) but presented no evidence resulting from such

investigations. Finally, the fourth paragraph presented a conclusion that, purportedly, could be drawn from existing research on the issue.

The two versions of the text were identical except for the fourth, concluding paragraph. Thus, in the risk version of the text, the conclusion stated that "taken together, investigations provide scientific evidence that there is a relationship between the use of cell phones and cancer", whereas in the no risk version of the text, the conclusion read "taken together, investigations provide scientific evidence that there is no relationship between the use of cell phones and cancer".

Please note that the text mainly contained passages collected from authentic sources that participants would typically encounter when reading to inform themselves about the issue in question, while the conclusions were created by the authors of this study. As an indication of text difficulty, we computed readability scores with the formula proposed by Björnsson (1968), which is based on word length and sentence length. When using this formula, readability scores range from about 20 (very easy text) to about 60 (very difficult text). Vinje (1982) reported that public information texts from the Norwegian government had a readability score of 45, while texts in the Norwegian code of laws had readability scores ranging from 47 to 63. The readability score for the cell phone text was 54, suggesting that it was somewhat more difficult than public information texts. (According to Björnsson (1983), The New York Times had a readability score of 56.)

2.2.4 Trust in conclusion

After having read the text and completed a filler task (see below), participants were provided with the title of the text and asked to state its main conclusion. Afterwards, they were asked to rate the extent to which they trusted the conclusion ("To what extent do you trust this conclusion?"), using a 5-point scale ranging from *not at all* (1) to *to a very high degree* (5).

2.2.5 Source memory assessment

Finally, participants were asked to describe the source of the conclusion based on what they had been reading ("Based on what you read, describe the source of this conclusion"). As an indication of students' attention to source feature information during reading, we coded their written responses to this question in terms of the features of the source that were mentioned. Based on the information provided in the text, participants could mention the following five source features when asked about the source of the conclusion: author, author's credentials, publication, type of publication, and date of publication. They were awarded two points for each of these features that were accurately and completely rendered (e.g., "a research reporter"), and one point for each of these source features that were accurately yet incompletely presented (e.g., "a reporter"). Source features that were not mentioned or incorrectly recalled received a code of zero. Thus, the scores on this source memory task had a theoretical maximum of 10. A random sample of 20% of participant responses to this question was independently scored by two raters, blind to condition, obtaining an inter-rater agreement of 100%.

As an additional indication of their attention to source feature information, participants were next given a cued recall task that directly asked them to write down everything they could remember about the source information provided for the text. The written instruction was: "Source information can include information about author, author's title/competence, name of publication, type of publication, date of publication, and so forth. You are now going to answer a question about source information that concerns the text on cell phones and health." The exact wording of the question was: "Write down everything you remember about the source information provided for the text." Again, participants were awarded two points for each source feature that was accurately and completely recalled, one point for source features that were accurately yet incompletely recalled, and zero points for those source features that

were not mentioned or recalled incorrectly. Thus, the scores on this source memory task also had a theoretical maximum of 10. A random sample of 20% of the cued source recalls was scored by two independent raters that were blind to condition, resulting in a perfect inter-rater reliability (100% agreement).

Please note that the first source memory task targeted participants' spontaneous attribution of the conclusion to source feature information, while the second source memory task, which was modeled after the cued source feature recall task recently used and validated in two experiments by Steffens et al. (2014), explicitly asked participants to provide information about relevant source features. Regarding task difficulty, it could be assumed that the instruction for the second task, which explained the meaning of source information and provided five distinct source features as retrieval cues, would support participants' memory for source features.[3] In all further statistical analyses we combined the source feature scores obtained when participants described the source of the conclusion (indirect question) and the source feature scores obtained when cued recall of source feature information was assessed (direct question). The scores on our combined source memory measure thus had a theoretical maximum of 20. We combined the scores on the two source memory tasks because we wanted to assess source memory in a somewhat broader way, as well as to create more variance in source memory (because, based on prior research, participants' source memory could be expected to be quite low). The reliability (Spearman-Brown coefficient) for scores on the two source memory tasks was .73 (cf., Eisinga et al., 2013).

2.3 Procedure

The first and the third author, together with two trained research assistants, group administered the materials to the participants during a regular 45-min lecture. Participation in the data collection was voluntary and all data were treated anonymously and confidentially.

Each participant received a folder containing all the materials. They answered a questionnaire on demographics before responding to the two topic belief items and the three perceived knowledge items (in that order). The text was then introduced with the following instruction, written on a separate sheet of paper: "We have copied an article on a current health issue. Read this article carefully to decide whether you ought to change some of your own habits. When you have finished, you will get some questions about what you read. It is therefore important that you try to remember what you read in this article." The text was then presented on a separate sheet of paper, with participants randomly assigned to one of the two versions of the text (i.e., risk vs. no risk). Thus, participants in the risk condition (n = 37) read a text concluding "taken together, investigations provide scientific evidence that there is a relationship between the use of cell phones and cancer", and participants in the no risk condition (n = 33) read a text concluding "taken together, investigations provide scientific evidence that there is no relationship between the use of cell phones and cancer". Participants did not look back to the text while completing the source memory assessment.

After finishing the text, participants first worked on three numeracy problems that were used as a filler task in this study because we wanted to examine whether source information was included in their mental representations of the text rather than probing their working memory capacity. After completing the filler task, participants were asked to state the main conclusion of the text they had read, rate their trust in this conclusion, describe the source of the conclusion, and respond to the cued source feature recall question. All participants finished the tasks within the allotted 45 minutes.

3. Results

First, a correlational analysis indicated that participants were less likely to trust conclusions the more they deviated from their prior topic beliefs. Specifically, when participants read that there is no risk, they trusted the conclusion less the stronger they

believed that cell phone use involves serious health risks, with r = -.59, p < .001. Further, when participants read that there is a risk, they trusted the conclusion more the stronger they believed that cell phone use involves serious health risk, with r = .65, p < .001 (and, conversely, trusted it less the weaker their beliefs in risk). Notably, these correlations are also consistent with the assumption that readers' plausibility perceptions are reflective of the relationship between their prior topic beliefs and textual information.

Descriptive statistics (means, standard deviations, values of skewness and kurtosis, and minimum and maximum scores) for trust in conclusion, perceived knowledge, topic beliefs, and source feature memory are reported in Table 1. Of note is that participants' source memory scores were quite low, with participants, on average, mentioning less than one of the source features in the text when their responses to the indirect and direct source feature questions were collapsed.[4] Moreover, because the descriptive statistics indicated that the score distribution for source feature memory was substantially positively skewed and peaked, we corrected those scores towards symmetry by means of standard transformation techniques (Tabachnick & Fidell, 2013) before computing correlations and regression equations. Specifically, we improved the deviation from normality for the source feature memory distribution through log transformation, with this resulting in a skewness of 1.35 and a kurtosis of .22. Please also note that we used a standardized version of the source feature memory variable in further analyses.

[Table 1 about here]

Table 2 displays the zero-order correlations between trust in conclusion, perceived knowledge, topic beliefs, and source feature memory for the entire sample, with gender also included in the correlation matrix. To directly address our research question concerning the Plausibility-Induced Source Focusing assumption, we performed a hierarchical multiple regression analysis with source feature memory as the dependent variable. In this analysis,

gender and scores on the perceived knowledge measure were entered into the equation in Step 1 to control for any gender differences and potential effects of prior knowledge about the topic. While gender was contrast-coded (male = -1, female = 1), the perceived knowledge variable was standardized. In Step 2, we included a contrast-coded variable representing text condition (no risk = -1, risk = 1) and a standardized version of the topic belief variable, as well as a variable representing the cross-product multiplicative term between text condition and topic beliefs. Thus, the interaction term was created and the regression analysis performed after contrast-coding text condition and standardizing the topic belief variable (Cohen, Cohen, West, & Aiken, 2003). Because gender and perceived knowledge did not contribute statistically significantly to the prediction of source feature memory scores, with R^2 = .01, $F(2, 67)$ = .48, *ns*, after Step 1, we dropped these variables from the model and reconducted the regression analysis with text condition, topic beliefs, and the interaction term as predictor variables. In this analysis, text condition and topic beliefs were entered in Step 1 and the interaction term was entered in Step 2. The results of this analysis are displayed in Table 3.

[Tables 2 and 3 about here]

As can be seen, text condition and topic beliefs did not explain a statistically significant amount of variance in source feature memory in Step 1, with R^2 = .05, $F(2, 67)$ = 1.80, *ns*. However, in the second step, the addition of the interaction between text condition and topic beliefs resulted in a statistically significant 9% increment in explained variance, with R^2 = .14, $F_{change}(1, 66)$ = 6.53, p = .013, after Step 2. In this step, the interaction was a unique negative predictor of source memory (B = -.29, p = .013)

Following Aiken and West (1991) and Dawson (2014), we graphed the statistically significant interaction between text condition and topic beliefs using one standard deviation above and one standard deviation below the mean of the standardized topic belief variable.

To interpret the nature of the interaction, we computed two sets of simple slope analyses, one for the effect of topics beliefs on source memory in each of the text conditions, and another for the effect of text condition on source memory at different levels of topic beliefs. The first set of analyses indicated that topic beliefs were statistically significantly related to source memory in the no-risk condition, $B = .43$, $t = 2.63$, $p = .011$, but not in the risk condition, $B = -.15$, $t = -.95$, *ns*. As displayed in Figure 1, when participants read that there is no risk, they recalled more source features the stronger they believed that cell phone use involves serious health risks. Specifically, for each increase of one standard deviation in topic beliefs, memory for sources increased almost one half (i.e., .43) standard deviation. However, when participants read that there is a risk, their recall of source features was not related to their scores on the belief measure. The second set of simple slope analyses revealed that at the level of one standard deviation above the mean of the topic belief variable, the effect of text condition was statistically significant, $B = -.47$, $t = -2.91$, $p = .005$, whereas at the level of one standard deviation below the mean of the topic belief variable, there was no statistically significant effect of text condition, $B = .12$, $t = .72$, *ns*. As Figure 1 illustrates, participants strongly believing that cell phone use involves serious health risks (i.e., 1 *SD* above the mean) scored almost one (i.e., .94) standard deviation higher on the source memory measure when they read that there is no risk than when they read that there is a risk. In contrast, participants that did not believe that cell phone use involves serious health risks (i.e., 1 *SD* below the mean) recalled a similar amount of source information regardless of text condition. We will return to the interesting finding that discrepancy at the level of high belief in cell phone health risks seems to matter more in terms of source feature memory than discrepancy at the level of low belief in cell phone health risks in the discussion.

[Figure 1 about here]

4. Discussion

Given the indisputable importance of critical reading and learning in the 21st century literacy context (Alexander & the Disciplined Reading and Learning Research Laboratory, 2012; Bråten & Braasch, in press; Leu et al., 2013), more knowledge about conditions that promote students' attention to the source features of a text is highly needed. In the current study, we therefore investigated to what extent encountering textual information that contradicts one's prior topic beliefs may represent such a condition, finding that memory for source feature information increased when the main conclusion of the text contradicted the belief that cell phone use involves serious health risks but not when it contradicted the belief that cell phone use does not involve such risks. The finding for readers believing in serious health risks is thus consistent with the Plausibility-Induced Source Focusing assumption proposed by de Pereyra et al. (2014), which suggests that readers may seek support from source feature information to make sense of content information deemed less plausible because it conflicts with prior knowledge or beliefs. However, somewhat surprisingly, discrepancy between textual claim and prior topic beliefs did not seem to matter in terms of source memory when readers believed that there were no risks. One possible reason is that the belief that cell phone use involves serious health risks, which runs counter to the widespread use of cell phones, also among people with apparently no related health issues, may be rooted in particular personal experiences and also have a stronger evaluative component than the belief that there are no such risks. Also, because those holding the belief that there are serious health risks may have arrived at this belief in a different, more deliberate way, they may feel more committed to it and more reluctant to revise it than those holding the more readily obtainable belief that there are no health risks. This, in turn, may make the belief-text discrepancy more salient to the former and orient them more towards checking the source in trying to counterargue it, which is consistent with the idea that increased attention to source information may be involved in trying to resolve coherence breaks by rejecting textual claims

that conflict with prior beliefs rather than by integrating prior beliefs and conflicting textual claims. In any case, our findings suggest that discrepancies between textual claims and prior topic beliefs may have different functional values in terms of promoting attention to source feature information depending on the exact nature of the discrepancy and how it is perceived by readers.

Recently, Britt et al. (2013), while calling for further empirical work on sourcing during single-text reading, posited that readers might be unlikely to separate source and content when they read only a single text on a topic, especially if this text does not contain discrepant claims presented by different sources (cf., Braasch et al., 2012). Accordingly, with only one source, within-text inconsistencies between claim and evidence (Steffens et al., 2014) or between textual claim and reader prior knowledge (de Pereyra et al., 2014) may not necessarily lead to better source memory than does single-text reading without such inconsistencies. There were some differences between the materials used in the current study and the materials used by Steffens et al. (2014) and de Pereyra et al. (2014) that may help explain why discrepancy had an effect on source memory in this study, however. First, as suggested above, an inconsistency between the textual claim that cell phone use does not pose any health risks and the prior belief that it involves serious risks may be salient and important to resolve for the reader, and possibly more so than the inconsistencies represented in the Steffens et al. (2014) and de Pereyra et al. (2014) studies (see also, Andiliou et al., 2012). Second, unlike in the Steffens et al. (2014) study, the source of our text was not an expert, and unlike in the de Pereyra et al. (2014) study, it was not embedded within the text itself, which means that it may have been regarded as more helpful in comprehending the inconsistency than the expert sources in the Steffens et al. (2014) study and more distinguishable from the content information than the embedded sources in the de Pereyra et al. (2014) study. Finally, in comparison with de Pereyra et al. (2014), the longer and more complex text materials used

in this study may have made it more difficult for readers to evaluate the plausibility of the claim, and possibly dismiss it right away, based on content information alone. Please also remember that in the current study, the text did not discuss any evidence that could be used to evaluate the merit of the presented claim (i.e., apart from the ways in which the issue had been investigated), making it quite difficult for readers to resolve the discrepancy by evaluating argument quality. (This way of presenting conclusions from investigations without discussing the evidence is also not uncommon in popular media.) More experimental work is obviously needed to clarify the extent to which such differences in materials are responsible for different findings across various studies.

Our study contributes uniquely to the literature on sourcing during single-text reading by suggesting that perceived implausibility associated with a discrepancy between a textual claim and prior topic beliefs may trigger attention to source feature information. Still, it should be acknowledged that readers' memory for source feature information was very low overall, with this corroborating prior work using single (e.g., Bråten, Strømsø, et al., in press; Steffens et al., 2014) as well as multiple texts (e.g., Britt & Aglinskas, 2002; Maggioni & Fox, 2009; Stadtler, Scharrer, et al., 2014; Stahl et al., 1996). For example, both Bråten, Strømsø, et al. (in press), who used the same source memory measure that we used in the present study with a sample of Norwegian students attending different bachelor-level programs in professional education, and Steffens et al. (2014), who used a cued-recall source memory task with North-American psychology undergraduates, found similarly low scores. Likewise, Stadtler, Scharrer, et al. (2014) found that German undergraduates from different majors included less than one source reference in their essays after reading nine texts on a controversial issue. One possible explanation is that the generally low level of sourcing observed across studies (for review, see Bråten, Stadtler, et al., in press) is due to cognitive overload, suggesting that when readers are processing and comprehending complex content,

remaining cognitive resources are insufficient to deal with available source information (Bråten et al., 2011; Stadtler, Thomm, Babiel, Hentschke, & Bromme, 2013). Another, related possibility is that students choose to prioritize content over source information, such that they deliberately define content as figure and source information as ground (Bråten, Strømsø, et al., in press; Stadtler, Thomm, et al., 2013). Accordingly, quite a few participants in the Bråten, Strømsø, et al. (in press) study wrote on their response sheets that they had not bothered to look at the source because they did not think they would need such information afterwards, and some wrote that they really did not care about source information (see also, Macedo-Rouet, Paul, Stadtler, & Rouet, 2016; Maggioni & Fox, 2009).

It is conceivable, however, that sourcing might increase considerably when readers work with topics for which they have stronger prior beliefs, for example topics engaging strong religious or political-ideological beliefs (cf., Gottlieb & Wineburg, 2012; Kahan et al., 2012), which are also contradicted by textual claims experienced as personally relevant. In such situations, involving strong prior beliefs that are part of a value system shared within a community to which the reader belongs and contradictory textual information high in personal relevance, perceived discrepancy might be more likely to trigger a cognitive process aimed at resolving the discrepancy that also draws on available source feature information (Kahan et al., 2012; Kruglanski & Shteynberg, 2012). It goes without saying that further experimentation is also needed to clarify the merit of this suggestion.

Among the limitations of the current study is the lack of processing data, based, for example, on analyses of concurrent verbal protocols (Ericsson & Simon, 1980), eye movements (Hyönä, Lorch, & Rinck, 2003), or trace logs created by software (Winne, 2010). Thus, while our offline measure of source feature memory might allow some inferences about readers' attention to source feature information during reading, online measures may be used in future studies to investigate processing differences resulting from more or less discrepancy

between reader beliefs and textual claims. Online measures also come with certain caveats, however. For example, as noted by Bråten, Strømsø, et al. (in press), there is a possibility that the think-aloud methodology used in some studies (e.g., Strømsø et al., 2013; Strømsø & Bråten, 2014) may have increased students' awareness of source information as they verbalized thoughts and processes concerning sources as well as contents of documents. On the other hand, think-alouds may compete for readers' limited cognitive resources, at least when non-experts work on complex tasks (Schraw, 2010). And, while less intrusive methodologies such as eye movements and trace logs (e.g., selections and processing time) may be viable alternatives, inferences about sourcing that are drawn from such processing data can also be hard to justify (Greene, Muis, & Pieschl, 2010; Schraw, 2010).

Second, no direct measure of readers' plausibility judgments was used in the present study, with such judgments inferred from the degree of discrepancy between readers' belief ratings and the direction of the textual claim (i.e., risk vs. no risk), and supported by correlations between belief-text discrepancy and trust in textual claims. In other work, plausibility has been measured by asking students to rate to what extent they consider information to be true (Isberner, Richter, Maier, Knuth-Herzig, Hortz, & Schnotz, 2013), possible (de Pereyra et al., 2014), or, simply, plausible (Lombardi et al., 2013). Preferably, future research on the Plausibility-Induced Source Focusing assumption should measure plausibility by directly examining perceptions of the potential truthfulness of the claims (Lombardi et al., 2013), either during or immediately after reading. However, using the term "plausible" in such measures may not be unproblematic because how individuals interpret this term may vary substantially (Lombardi et al., 2016). For example, in Norwegian, "plausible" is a relatively low-frequency foreign word with a meaning related to the meaning of words such as likely, possible, assumed, expected, predictable, reasonable, convincing, and probable (Rosbach, 2001). Whether Norwegian students would interpret plausible in the same way as

would German, French, or North-American students is thus an issue wide open for empirical study. Indeed, measuring plausibility in a direct way across languages may require much cross-cultural collaboration among researchers in developing measures that can ensure construct-invariability across different studies.

Third, this study is limited because each participant read only one text from one source about a single topic. Although we intentionally had participants read one longer and more complex text in the present study, rather than a large number of very brief texts, which has been used in previous work (Braasch et al., 2012; de Pereyra et al., 2014), our use of only one text may limit the generalizability of our findings. Thus, while we certainly were able to provide proof of concept by studying the Plausibility-Induced Source Focusing assumption in this way, additional studies are needed to investigate this assumption with different texts, sources, and topics.

Fourth, because we included only bachelor-level students of economics and administration in this study, more research with participants drawn from different populations is also needed to probe the generalizability of our findings.

Finally, because we did not measure readers' comprehension of the text, it is somewhat unclear how carefully they studied the content. Thus, although we ensured that participants remembered the main conclusion of the text, which was considered most important for the present purpose, future studies of this issue should also assess readers' memory for and comprehension of the preceding text content. Measuring text comprehension in future studies would also allow researchers to assess the extent to which increased sourcing as a result of belief-claim discrepancy is associated with better comprehension performance.

Despite such limitations, we hope that this study may provide new impetus to a line of research that is important not only for theoretical but also for educational reasons. Assigning reading tasks that trigger attention to source feature information is one way instructors may

help students overcome a general tendency to disregard sources and pay attention to nothing but content during reading. In a wider sense, texts presenting claims contradicting students' prior beliefs may be used to signal the importance of trying to arrive at an unbiased conclusion by taking all available information, including source features, into consideration when weighing the merit of the claim. To counteract tendencies towards biased source-based evaluations of belief-inconsistent information in such contexts, students may first be explicitly instructed to take source features into consideration when evaluating belief-consistent as well as belief-inconsistent information, to justify their source-based evaluations, and to compare the evaluation criteria used for the two types of information. In this way, students may be helped to develop consistent criteria for source-based evaluation of textual claims that are independent of their prior beliefs about the topic.

Notes

[1] This aspect of Lombardi et al.'s (2016) model of plausibility judgments, when combined with the Plausibility-Induced Source Focusing assumption of de Pereyra et al. (2014), suggests that the relationship between plausibility judgments and sourcing may be bidirectional rather than unidirectional.

[2] However, although perceptions of trust in claims and perceptions of plausibility can be considered partly overlapping constructs, the construct of trust in claims also introduces the notion of willingness to depend on the truthfulness of information (Kelton, Fleischmann, & Wallace, 2008; Lucassen & Schraagen, 2011).

[3] There was no statistically significant difference between scores on the two source memory tasks, however, with $z = .91$, *ns*, $r = .11$. The correlation between scores on the two tasks was $\tau = .55$, $p < .001$.

[4] Twenty-seven per cent of the participants obtained a source memory score of 1 or above.

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Table 1

Descriptive Statistics

	M	(*SD*)	Skewness	(*SE*)	Kurtosis	(*SE*)	Min	Max
Trust in conclusion	3.06	(0.97)	-.21	(.29)	-.04	(.56)	1	5
Perceived knowledge	4.60	(2.10)	.57	(.29)	-.09	(.57)	1	10
Topic beliefs	5.84	(2.89)	-.08	(.29)	-1.37	(.56)	1	10
Source feature memory	0.75	(1.41)	1.88	(.29)	2.74	(.56)	0	6

Table 2

Zero-Order Correlations for All Participants

Variable	1	2	3	4	5
1. Gender	-				
2. Trust in conclusion	.06	-			
3. Perceived knowledge	-.16	.04	-		
4. Topic beliefs	.11	-.03	.23	-	
5. Source feature memory	-.09	-.18	.08	.12	-

Note. Male = -1, female = 1.

Table 3

Results of Multiple Regression Analysis for Variables Predicting Source Feature Memory

Predictor	*B*	*SE B*
Step 1		
Text condition	-.18	.12
Topic beliefs	.13	.12
Step 2		
Text condition	-.18	.11
Topic beliefs	.14	.12
Text condition X Topic beliefs	-.29*	.12

Note. R^2 = .05 for Step 1 (*ns*), ΔR^2 = .09 for Step 2 (p = .013).

*p < .05.

Figure Caption

Figure 1. Interaction between text condition (risk vs. no risk) and topic beliefs for source feature memory.

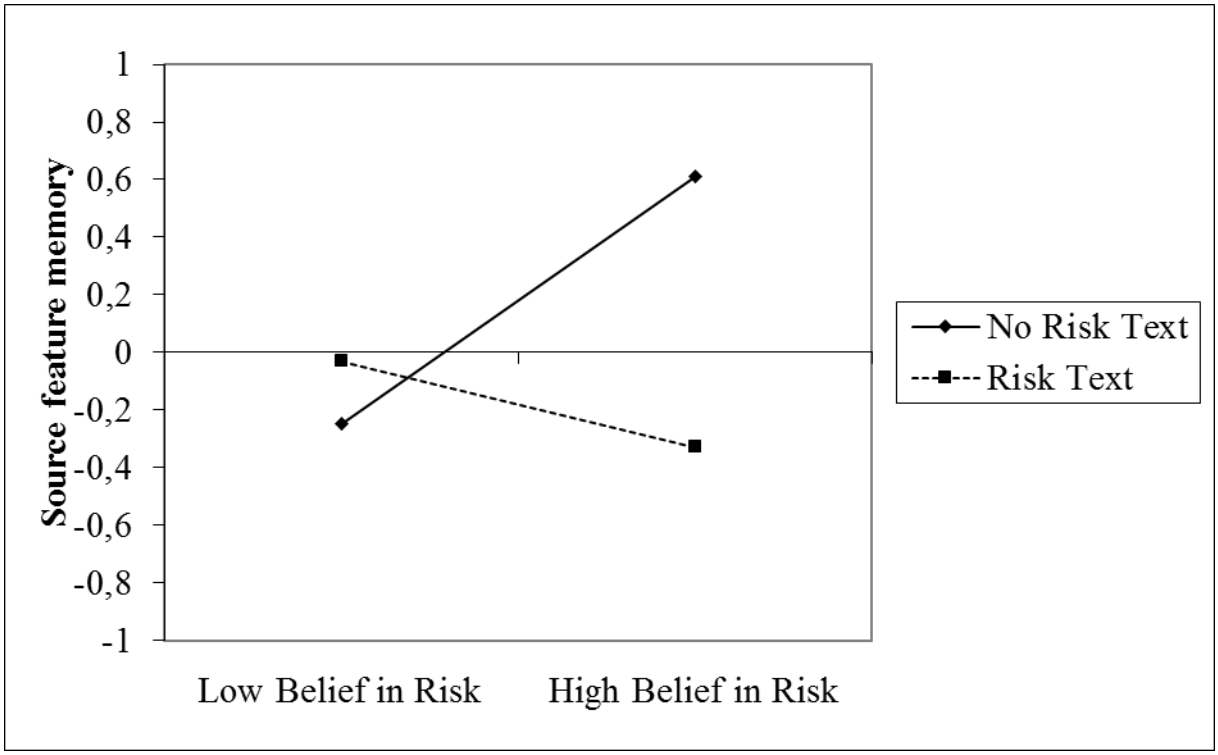
Source feature memory
1
0,8
0,6
0,4
0,2
0
-0,2
-0,4
-0,6
-0,8
-1
Low Belief in Risk
High Belief in Risk
No Risk Text
Risk Text

Figure 1.