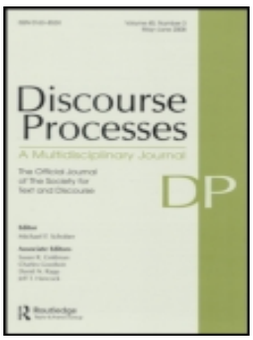

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Discourse Processes

ISSN: 0163-853X (Print) 1532-6950 (Online) Journal homepage: http://www.tandfonline.com/loi/hdsp20

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Lisa Scharrer , M. Anne Britt , Marc Stadtler & Rainer Bromme

**To cite this article:** Lisa Scharrer , M. Anne Britt , Marc Stadtler & Rainer Bromme (2013) Easy to Understand but Difficult to Decide: Information Comprehensibility and Controversiality Affect Laypeople's Science-Based Decisions, Discourse Processes, 50:6, 361-387, DOI: 10.1080/0163853X.2013.813835

**To link to this article:** http://dx.doi.org/10.1080/0163853X.2013.813835

Accepted author version posted online: 24 Jun 2013.
Published online: 24 Jun 2013.

*Discourse Processes*, 50:361–387, 2013

ISSN: 0163-853X print/1532-6950 online
DOI: 10.1080/0163853X.2013.813835

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# Easy to Understand but Difficult to Decide: Information Comprehensibility and Controversiality Affect Laypeople's Science-Based Decisions

Lisa Scharrer
*Department of Psychology*
*University of Muenster, Muenster, Germany*

M. Anne Britt
*Psychology Department*
*Northern Illinois University*

Marc Stadtler and Rainer Bromme
*Department of Psychology*
*University of Muenster, Muenster, Germany*

Well-educated laypeople tend to rely on their own ability to evaluate scientific claims when they obtain information from texts with high comprehensibility. The present study investigated whether controversial content reduces this facilitating effect of high text comprehensibility on readers' self-reliance and whether the influence of comprehensibility and controversiality is mediated by perceived epistemic topic complexity. Eighty-eight students of nonmedical subjects read medical texts of varying comprehensibility and controversiality and indicated their willingness to rely on their own judgment. Participants' reliance on their own judgment was indicated by persuasion and confidence in claim agreement. The results showed that recipients' reliance was stronger after reading comprehensible rather than incomprehensible texts, but this difference was larger

Correspondence concerning this article should be addressed to Lisa Scharrer, University of Muenster, Department of Psychology, Fliednerstrasse 21, 48149 Muenster, Germany. E-mail: lisa.scharrer@uni-muenster.de

if texts were uncontroversial rather than controversial. These effects, however, were not mediated by perceived epistemic topic complexity. Implications for the communication of scientific knowledge to the lay public are discussed.

Today, the general public widely uses the Internet as a source for information that can help them reach informed decisions about the validity of scientific knowledge claims, for example, regarding health issues (Eastin, 2001). Although the Internet has greatly eased the retrieval of science-based information, a huge challenge lies in the evaluation of the acceptability of claims such information contains (e.g., Bromme, Kienhues, & Porsch, 2010).

A reason this evaluation presents such a challenge is that we all are laypeople regarding most science domains. Laypeople, unlike experts, are not specifically trained or experienced in a given domain and, unlike novices, do not strive to become experts through such training (Bromme, Rambow, & Nückles, 2001). Hence, whether an individual is a layperson depends on choice of domain. Laypeople lack the deep-level background knowledge usually required for making well-founded decisions. Consequently, they are generally not in a position to decide about domain-related claims by themselves but rather depend on experts for support (Bromme et al., 2010; Keil, 2008). A particular subgroup of laypeople is "well-educated laypeople," those who have received or are receiving academic training. In contrast to laypeople without an academic background, they are likely to have a better general understanding of the comprehensiveness of science knowledge and of the role of evidence, controversy, and expertise in science. Nevertheless, with respect to domains in which they were not specifically trained, they are still laypeople and lack the deep-level knowledge necessary to make truly informed decisions. Survey data show that young, educated individuals are most likely to search online for scientific information such as health information (Andreassen et al., 2007; Fox, 2005). Well-educated laypeople's handling of science-based online information is therefore of particular relevance and is the focus of the present research. For reasons of readability, we subsequently refer to the examined individuals as "laypeople," but readers should bear in mind that in doing so we presently do not include laypeople from a nonacademic background.

Laypeople can choose between two major courses of action when having to decide about a claim: Either they can rely on their own judgment notwithstanding their lay status or they can outsource the decision to an expert. However, given their epistemic limitations, reverting to experts is most often the appropriate strategy (Scharrer, Bromme, Britt, & Stadtler, 2012). If laypeople nevertheless choose to rely on their own judgment, this should be reflected in their tendency to be easily persuaded by argument. It is only when laypeople see themselves in a position to evaluate information quality that they would show strong opinions about information persuasiveness—as indicated by agreement with a claim and a positive

evaluation of supporting information as *credible* (e.g., Eysenbach, 2008; O'Keefe, 2002). In addition, laypeople's willingness to rely on their own claim-agreement decisions should be reflected in high decision confidence (Scharrer et al., 2012).

## INFORMATION COMPREHENSIBILITY INCREASES SELF-RELIANCE

When laypeople search the Internet to gather information about a science-based issue, they may encounter different forms of scientific depictions. On the one hand, the Internet provides access to information actually intended for a scientific audience, such as research articles from professional journals. This information is likely to contain technical language beyond a layperson's understanding and may be obviously difficult to interpret and evaluate. On the other hand, laypeople may encounter popular scientific reports where information is frequently simplified to make it understandable for lay audiences (e.g., Goldman & Bisanz, 2002; Singer, 1990), for instance, by increasing comprehensibility.

Although an increase in comprehensibility facilitates laypeople's ability to form a coherent mental representation of the content and follow what is being said, it may also raise their inclination to rely on their own decisions (Scharrer et al., 2012). For example, Eagly (1974) found incomprehensible arguments to cause weaker claim agreement than comprehensible arguments among domain novices. Moreover, Scharrer et al. (2012) demonstrated that reading comprehensible arguments on medical and climate-related topics led laypeople to more strongly and confidently agree with claims compared with incomprehensible texts. These findings raise the questions of whether and how it is possible to comprehensibly inform laypeople about scientific topics without tempting them to overconfidently rely on their own judgment.

## INFLUENCE OF CONTROVERSIALITY ON SELF-RELIANCE

One textual feature that may counteract the influence of comprehensibility on laypeople's reliance on their own judgment is information controversiality. Because of the evolving and discursive nature of scientific knowledge production, there are frequently contradicting views on a particular phenomenon. Confronting laypeople with controversial information should result in a break of coherence in laypeople's mental representation, even if text information is comprehensible. Their inability to restore coherence by means of background knowledge (e.g., by discounting one position as invalid) may facilitate laypeople's insight that they are not equipped to evaluate claim veracity.

Empirical findings from educational and cognitive psychology support this reasoning. Kienhues, Stadtler, and Bromme (2011) assessed the influence of

conflicting and consistent medical online information on laypeople's decision about whether one should take medication against high cholesterol levels. If the information was controversially discussed between sources, laypeople were less likely to advise a fictitious friend to take medication. A study by Yaniv, Choshen-Hillel, and Milyavsky (2009) demonstrated that individuals were more confident in their decision about estimated calorie value of food if advice from different sources was consensual compared with conflicting.[1]

In sum, although empirical findings have demonstrated that recipients are more hesitant to agree with claims when information is controversially discussed, it has as yet not been investigated whether the impact of information controversiality can mitigate the persuasive comprehensibility effect. Furthermore, the cognitive processes that underlie the impact of comprehensibility and controversiality on self-reliance are still unclear.

## POSSIBLE UNDERLYING MECHANISM

On a theoretical level it is conceivable that the effects of comprehensibility and controversiality on laypeople's self-reliance are both mediated by their assessment of the "epistemic topic complexity" (ETC). By perceptions of ETC, we refer to notions of the complexity of topic knowledge and of the difficulty of acquiring and interpreting this knowledge. Hence, the construct of ETC comprises aspects of topic-specific epistemic beliefs regarding the dimension "texture of knowledge," which reflects beliefs about knowledge structure and accuracy (Stahl & Bromme, 2007). Above this, ETC mirrors beliefs about how easy it is to understand knowledge on a given topic (Keil, Lockhart, & Schlegel, 2010).[2]

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[1]Further evidence has indicated that under certain circumstances, the presentation of counterarguments can facilitate rather than diminish persuasion with a claim (for an overview, see O'Keefe, 1999). However, in these cases, pro and con arguments were given by the same source in a two-sided message. Mentioning arguments against the source's own position might increase recipients' impressions of source honesty, credibility, and knowledgeability and hence render the ultimate conclusion in favor of a claim all the more convincing (Eisend, 2007). This situation is qualitatively different from confronting recipients with competing arguments from different sources, where encountering opposing arguments should increase skepticism. The present research was focused on controversy between different sources, and for reasons of brevity we refer to this state of affairs by "information controversiality." However, the reader should keep in mind that controversiality can also occur within a source's message, which might impact differently on the recipient.

[2]ETC also differs from information comprehensibility in that comprehensibility refers to a feature of the *depiction* of knowledge (i.e., of an external representation intended for communication). In contrast, ETC refers to a feature of knowledge itself. There is of course a relationship between comprehensibility and ETC, because comprehensibility is more difficult to achieve when depicting complex knowledge, but both constructs are nevertheless fundamentally different.

If laypeople encounter simplified texts tailored for them to comprehend, their understanding may mislead them to consider the subject matter as less complex than it really is (cf. Goldman & Bisanz, 2002; Scharrer et al., 2012). Because of the ease of comprehending, they may overestimate their actual insight into the topic and their ability to appropriately evaluate the provided information (cf. Keehner & Fischer, 2011). Likewise, laypeople may explain information controversiality with high ETC. A recent interview study by Bromme, Thomm, and Wolf (2013) showed that laypeople consider differences in experts' approaches as a possible reason for conflict within scientific information. Hence, encountering a conflict may alert laypeople to the possibility that scientists can have opposing views on the same issues because of potential variations in their school of thought, specific focus, or applied methodology. At the same time, given the insufficiency of their own background knowledge to restore coherence, laypeople may conclude that their own knowledge cannot keep up with the high epistemic complexity of the topic.

## PRESENT STUDY

The present study investigated whether there is a combined effect of text comprehensibility and controversiality on lay recipients' reliance on their own science-based decisions. Specifically, we pursued two goals. The first was to assess whether the increased self-reliance after reading comprehensible compared with incomprehensible information observed in past studies (Eagly, 1974; Scharrer et al., 2012) is reduced when this information contains conflicting rather than consistent positions. The second goal, given the above considerations about the possible mediating role of perceived ETC, was to gain insight into the processes by which comprehensibility and controversiality exert their influence on self-reliance.

We presented lay readers with argumentative texts about medical issues that varied in comprehensibility and controversiality. Similar to the approach by Scharrer et al. (2012), laypeople's reliance on their own decision was assessed by how likely they were persuaded by provided information and by their self-reported confidence in their own claim-agreement decision. Persuasion was indicated by recipients' claim agreement and their credibility evaluation of the provided claim-supporting information. Confidence was reflected in laypeople's respective preferences of three strategies they might follow to reach a claim-agreement decision (henceforth referred to as decision strategies). In the case of high decision confidence, laypeople should favor the strategy of deciding based on the information they have already gained. At an intermediate level of confidence, one would expect a preference for the strategy of searching for further information on which to base a self-reliant decision. This means that recipients are

not yet sufficiently confident to decide based on the current information but principally regard themselves as able to evaluate the information. Finally, in cases of low confidence, laypeople would be expected to outsource the decision to an expert.

For assessing laypeople's reliance on their own evaluations, we used two different measurements. In addition to standardized self-report measures, we collected a performance measure, investigating how they applied acquired topic-knowledge in a communication situation.

### Goal 1: Assessing the Combined Influence of Comprehensibility and Controversiality

Based on previous findings (e.g., Kienhues et al., 2011; Scharrer et al., 2012), we expected that reading comprehensible texts would lead to greater claim agreement and an evaluation of claim-supporting information as more credible but that these comprehensibility effects would be mitigated when the received information is controversial (Hypotheses 1a/b). Analogously, laypeople should be more willing to make a decision at their present knowledge level after reading comprehensible than incomprehensible texts, but this effect should be more pronounced in the case of uncontroversial than controversial information (Hypothesis 2a). Similarly, the inclination to obtain further information on which to base a self-reliant decision should be stronger after reading comprehensible than incomprehensible texts, but this difference should be greater in the case of uncontroversial than controversial information (Hypothesis 2b). Finally, incomprehensible texts should lead to a stronger desire to consult an expert than comprehensible texts if the information is uncontroversial but to a lesser degree if it is controversial (Hypothesis 2c). This is because laypeople should have a high inclination to consult an expert if information is controversial, regardless of text comprehensibility. The moderating effect of controversiality should also manifest when laypeople communicate their acquired topic knowledge. Laypeople should be more likely to express their agreement with the claim in question (Hypothesis 3) and less likely to express uncertainty (Hypothesis 4) after reading comprehensible than incomprehensible uncontroversial information; however, this effect should be mitigated if the information is controversial.

### Goal 2: Identifying the Underlying Process

As outlined above, it is conceivable that reading comprehensible and uncontroversial texts may lead laypeople to consider the topic as comparatively uncomplex and consequently their own epistemic capabilities as sufficient to evaluate related claims. We therefore considered it possible that laypeople's impression of ETC mediates the influence of comprehensibility and controversiality on laypeople's persuasion strength and confidence. However, because of a lack of

relevant research, the question as to the mediating role of perceived ETC is exploratory in nature, preventing us from formulating specific hypotheses.

## METHODS

### Design and Participants

To test our hypotheses and research question, we conducted an experiment using a 2 × 2 mixed design with information comprehensibility (comprehensible vs. incomprehensible) as within-participant factor and information controversiality (controversial vs. uncontroversial) as between-participant factor.[3] Each participant read text information about four medical issues (two issues per comprehensibility condition), which were purportedly retrieved from the Internet. The information on each issue consisted of two text documents, so that every participant read a total of eight texts. Order of exposure to the comprehensibility conditions was balanced among participants by using an incomplete block design. Across the sample, the four sets of information were presented in different sequences, so that comprehensible and incomprehensible sets were presented equally often at the first to fourth position.

Eighty-eight undergraduate students of various majors at a German university participated (34 men and 54 women; mean age = 22.81 years, $SD = 4.39$). All participants were fluent in German (82 had German as their first language) and were on average in their fourth semester of studies ($M = 4.21$, $SD = 3.19$). To ensure participants' lay status, students of medicine, biology, or related subjects were excluded from participation.

### Materials

#### *Medical Text Information*

Sets of text information were created, each addressing one of four medical issues. The issues were derived from real-world phenomena but were nevertheless fictitious in nature to prevent influences of prior knowledge or attitudes on information processing and evaluation (e.g., Erb, Bohner, Rank, & Einwiller, 2002). We focused on situations where laypeople lack prior knowledge and

[3]The reason why controversiality was varied interindividually rather than intraindividually was to prevent spillover effects from the controversial to the uncontroversial conditions. Encountering one controversial issue might increase the salience of a reader's potential knowledge about the frequency of conflict and tentativeness in science knowledge. Had the same participant been confronted with both controversial and uncontroversial information, this might have affected their subsequent reaction to uncontroversial issues.

opinions because these are the situations when they should be most likely to look up information to reach a decision.

Each text set consisted of a document (Document 1) containing a particular medical knowledge claim (e.g., "Bouchard arthrosis is caused by a deficiency of purinerase"), which was stated at the beginning, followed by an explanation of the mechanisms underlying the proposed claim (e.g., explaining how a deficiency of purinerase leads to Bouchard arthrosis). This was followed by empirical support for the proposed claim (e.g., data that demonstrate the proposed relationship of purinerase deficiency and Bouchard arthrosis). Depending on the controversiality condition, the information contained in Document 1 was rendered either controversial or uncontroversial. This was done by presenting a second document (Document 2) containing information that was or was not in conflict with Document 1. In the controversial condition, Document 2 comprised a counterclaim, negating the effect proposed in the Document 1 claim (e.g., "A lack of purinerase is not among the causes of Bouchard arthrosis") and empirical evidence supporting this counterclaim. In the uncontroversial condition, Document 2 comprised a claim related to the topic from Document 1, but this claim did not pertain to the relationship proposed in Document 1. This was done by replacing one construct in the Document 2 claim from the controversial condition; for instance, "a lack of purinerase" was replaced so that Document 2 asserted that "a persistent lack of folic acid is not among the causes of Bouchard arthrosis." Apart from this replacement, the contents of Document 2 were identical in both controversiality conditions.[4]

The information contained in the texts was furthermore comprehensible or incomprehensible. In the incomprehensible conditions, both documents contained a large number of unexplained technical terms ($M = 39.25$, $SD = 12.35$), which should render the information difficult or impossible to understand for laypeople (Nagy, 1988). In contrast, the comprehensible conditions translated the contents into words that should be familiar and understandable for laypeople (e.g., "articulations" in the incomprehensible condition was replaced by "joints" in the comprehensible condition). Only comprehensibility of the argument support but not the claim was manipulated. All documents were similar in length with a mean word count of 142.67 ($SD = 44.66$). A total of four variations of document sets were created per medical issue, analogous to the experimental conditions.

[4]Note that the evidence contained in Document 2 is empirically weaker than the evidence in Document 1, because it only confirms the absence of an effect, thus the null hypothesis. However, this still demonstrates a failure to replicate the findings stated in Document 1 and thus represents a contradiction. We chose to propose and confirm a null relationship in Document 2 rather than a relationship in the opposite direction to that claimed in Document 1 (e.g., "Bouchard arthrosis is caused by an excess of purinerase") to maximize the naturalness of our text materials. Whereas arguments in science frequently address the question whether or not an effect or a relationship exists, it is less often disputed whether the relationship is in one or the opposite direction.

### *Framing Stories*

Before reading the medical text information, participants were presented a framing story that provided a context for their document reading (Stadtler & Bromme, 2008). In the framing story, the participant was asked to imagine that a good friend had a certain medical problem, but because they were unsure about the correctness of a problem-related claim (the claim later addressed in Document 1), they asked the participant for advice. Participants were furthermore asked to imagine they had done research on the Internet to find an answer to their friend's question and were presented two text documents they had allegedly found during their search. It was pointed out to participants that both documents stemmed from different authors, but no further author information was provided. A separate framing scenario was presented for each medical issue. The documents were presented as two web browser screenshots to increase the impression they stemmed in fact from the Internet. The design of the document pages was kept neutral without any frames or graphics to prevent unwanted influences on participants' document evaluation (Eysenbach, 2008). To ensure our readers recognized the conflicting nature of the documents in the controversial condition, the inconsistency was explicitly pointed out in the instructions after text reading ("As you have just read, the author of the first text writes that [Document 1 claim]. Contrary to this, the author of the second text writes that [Document 2 claim]").

## Measures

### *Manipulation Check*

To verify that comprehensibility had been manipulated as intended, participants rated each document on a Likert scale (from 1 = "very incomprehensible" to 7 = "very comprehensible"). Before providing their ratings, participants were given a definition of comprehensibility based on components of Jucks' (2001) questionnaire measuring laypeople's perspective on text comprehensibility. This definition described information as comprehensible when readers perceive the contents as clear and feel able to discriminate essential from less important parts and to evaluate information consistency.

### *Persuasion*

*Claim agreement.* Participants' agreement with the claim from Document 1 was assessed after reading both documents. For this purpose, participants indicated their agreement on a 1 ("I don't agree at all") to 7 ("I totally agree") Likert scale.

*Perceived information credibility*. Credibility of Document 1 was measured with four adjective pairs in a seven-point scale semantic differential format (very well-founded to very badly founded, very strong to very weak, very reliable to very unreliable, and very credible to very uncredible). Three additional distracter pairs were presented to reduce transparency of the measurement intent (very boring to very entertaining, very unscientific to very scientific, and very uncomplicated to very complicated). A total score of perceived credibility was determined by calculating the arithmetic mean of the attractor items. The same measure was used to assess perceived Document 2 credibility. Although credibility ratings of Document 2 do not directly relate to our hypotheses, they complete the picture of how laypeople evaluate information relevant for their claim decision. Internal consistency of the measure was good in both comprehensibility conditions and for both documents (Cronbach's $\alpha$ between .83 and .90).

### *Confidence in the Claim Agreement Decision*

Participants' confidence in their own capability to decide about the Document 1 claim was indicated by their respective agreement with three decision strategies on seven-point Likert scales (1 = "don't agree" to 7 = "strongly agree").

*Trust in own agreement decision based on present knowledge*. Following the first decision strategy meant that the participant felt ready to decide by themselves about the claim, based only on their current knowledge. Preference for this strategy was measured through agreement with the statement "Based on my present knowledge about the topic, I am confident to decide whether it is correct that [Document 1 claim statement inserted]."

*Trust in own decision based on further information*. Following the second decision strategy meant that the participant felt principally able to decide, but only after obtaining further topic information. This was indicated by agreement with the statement "I want to obtain further information about [topic] which I then use to decide myself whether it is correct that [Document 1 claim statement inserted]."

*Desire to consult an expert*. Following the third decision strategy meant that rather than deciding by themselves, participants wished to consult a competent and credible expert whom to hand over the decision. Preference for this strategy was measured by agreement with the statement "I want to obtain information about experts in the field in order to identify a particularly competent and credible expert. I would then consult this expert and rely on their judgment as to whether it is correct that [Document 1 claim statement inserted]."

We decided to measure strategy preference using separate Likert scales rather than having participants choose between strategies because in reality the three strategies are not mutually exclusive. For example, participants with an intermediate to low level of confidence may be strongly inclined to make their own decision based on further information but at the same time may wish to seek out expert advice for additional reassurance.

### *Application of Knowledge in a Communication Situation*

After text reading, participants wrote a short letter to their fictitious friend where they provided their opinion about the Document 1 claim and gave reasons for their answer. The letters were analyzed for expressions of claim agreement and uncertainty.

*Expression of claim agreement.* Whether participants indicated agreement with the claim was coded in a dichotomous format (contained vs. not contained). "Contained" was coded independently from whether or not agreement was expressed with certainty or uncertainty. For example, the following statement was coded as indicating claim agreement: "Yes, it's true that Bouchard arthrosis is caused by a deficiency of purinerase."

*Expression of uncertainty.* In the same dichotomous format (contained vs. not contained), it was coded whether participants indicated uncertainty about their opinion about the claim, independently from whether or not the participant's opinion was in favor of the claim. An example statement for contained uncertainty is as follows: "I assume that Bouchard arthrosis is caused by a deficiency of purinerase, but I'm not completely certain."

### *Perceived ETC*

Participants' perception of ETC was assessed with six adjective pairs in a seven-point scale semantic differential format (very uncomplex to very complex, very single-faceted to very multifaceted, very unscientific to very scientific, very easy to very difficult, very uncomplicated to very complicated, and very difficult to comprehend to very easy to comprehend). Two additional distracter pairs were presented to decrease transparency of the measurement intent. Exploratory factor analyses (ML-extraction, oblimin rotation) showed the target items to load on one common factor in both comprehensibility conditions (comprehensible: KMO $= .88$; $\chi^2(15) = 350.71$, $p < .001$; 70.43% explained variance; incomprehensible: KMO $= .86$; $\chi^2(15) = 230.52$, $p < .001$; 58.88% explained variance). To determine a score of perceived ETC, the arithmetic mean of the target items was calculated. Internal consistency was good in both comprehensibility conditions (comprehensible: Cronbach's $\alpha = .91$; incomprehensible: Cronbach's $\alpha = .86$).

### *Epistemic Beliefs About Medicine*

As a control variable we measured participants' epistemic beliefs regarding the medical domain using the Epistemic Beliefs Assessment for Medicine by Kienhues and Bromme (2012). This was done because previous theory and research suggest that epistemic beliefs have an influence on the processing and evaluation of conflicting information (e.g., Mason & Boscolo, 2004). The instrument consists of 24 statements about the nature of medical knowledge and knowledge sources to which participants express their level of agreement on five-point Likert scales that measure the five dimensions "certainty of medical knowledge" (seven items), "credibility of medical textbooks" (four items), "credibility of medical information on the Internet" (four items), "justification of medical knowledge" (i.e., the extent to which knowledge is regarded as better justified by experience than by medical research, four items), and "preliminarity of medical knowledge" (five items). Internal consistency of the subscales was satisfactory (Cronbach's $\alpha$ between .71 and .78) with the exception of "justification of knowledge" ($\alpha = .56$) and "certainty of knowledge" ($\alpha = .68$).

## Procedure

Data collection took place in group settings with a maximum of eight participants and lasted about 45 min. Participants received a paper booklet containing the text materials and measures. The booklet first presented a scenario describing the fictitious friend's problem. Participants then read the document pair, provided their measures of claim agreement and decision confidence, and wrote an advising letter to their fictitious friend. This was repeated four times, so each participant read four document pairs in total. Afterward, readers were asked to provide their ratings of document comprehensibility and credibility and to evaluate the epistemic complexity of each addressed topic. Participants then completed the Epistemic Beliefs Assessment for Medicine (Kienhues & Bromme, 2012) and a demographic questionnaire before they were finally debriefed about the fictitious nature of the text information.[5] Participants were told to work through the booklet in a chronological order but were not prohibited from looking

[5]Epistemic beliefs were measured subsequent to text reading to avoid influences on the dependent measures as a result of completing the Epistemic Beliefs Assessment for Medicine. Considering items about Internet credibility, for example, might otherwise have activated laypeople's knowledge about many online sources being of dubious credibility. This in turn could have made them generally skeptical toward the encountered text materials. Conversely, it is of course possible that text reading affected participants' answer to the Epistemic Beliefs Assessment for Medicine items, and this should be kept in mind when interpreting the results. However, in light of our research goals we considered unintended effects on the dependent variables a more serious problem.

back at the texts when providing the dependent measures. This was done to ensure that participants' answers were not influenced by memory effects.

## RESULTS

We first checked for differences between both controversiality groups regarding epistemic beliefs about medical knowledge. *t* tests for independent measures showed no differences between participants of both groups regarding any of the five subscales, all $t(86) < .89$, *ns*. The control variable was therefore dropped from further analyses.

Throughout the experiment our participants worked on four scenarios that exhibited great structural similarity. Therefore, we also tested whether scores on the dependent measures were influenced by the order of scenario presentation. Repeated-measures ANOVAs with presentation order (positions 1 to 4) as within-participant factor on scores of comprehensibility, credibility, claim agreement, and decision strategies revealed no significant order effects for any of the dependent measures (all $F < 1.95$, *ns*).

Finally, to ensure the comprehensibility manipulation had been successful, a mixed ANOVA was conducted on comprehensibility ratings with document (Document 1 vs. Document 2) and comprehensibility (comprehensible vs. incomprehensible) as within-participant factors and controversiality (controversial vs. uncontroversial) as between-participant factor. Results showed a significant main effect of comprehensibility, $F(1, 85) = 648.11$, $p < .001$, part. $\eta^2 = .88$, indicating that, as intended, texts designed as comprehensible were perceived as more comprehensible (Estimated Marginal Means [*EMM*] = 5.82, $SE = .10$) than texts designed as incomprehensible ($EMM = 2.14$, $SE = .11$). Moreover, we found a significant main effect of document, $F(1, 85) = 22.54$, $p < .001$, part. $\eta^2 = .21$, due to Document 2 being rated as more comprehensible ($EMM = 4.16$, $SE = .09$) than Document 1 ($EMM = 3.80$, $SE = .08$). All other main and interaction effects did not reach significance, all $F(1, 85) < 2.91$, *ns*. The unpooled means and standard deviations of the collected measures are shown in Table 1.

### Persuasion

#### *Claim Agreement*

Claim agreement ratings were subjected to mixed ANOVAs with the within-participant factor comprehensibility and the between-participant factor controversiality. Results showed a significant main effect of comprehensibility, $F(1, 86) = 9.34$, $p = .003$, part. $\eta^2 = .10$, due to laypeople agreeing more

TABLE 1
Means (and Standard Deviations) for Agreement With the Document 1 Claim, Perceived Information Credibility, Trust in Own Decision Based on Present Knowledge, Trust in Own Decision Based on Further Information, Desire to Consult an Expert, and Perceived ETC as a Function of Comprehensibility and Controversiality

| *Condition* | *Claim Agreement* | *Credibility* | | *Decision Based on Present Knowledge* | *Decision Based on Further Information* | *Decision Through Expert Advice* | *ETC* |
|---|---|---|---|---|---|---|---|
| | | *Document 1* | *Document 2* | | | | |
| Compr./uncontr. | 4.53 (1.05) | 4.87 (.89) | 4.21 (.79) | 3.30 (1.66) | 5.16 (1.57) | 5.16 (1.87) | 4.38 (1.03) |
| Incompr./uncontr. | 3.90 (1.04) | 4.43 (.94) | 4.27 (.81) | 2.10 (1.31) | 5.25 (1.64) | 5.41 (1.65) | 5.46 (.86) |
| Compr./contr. | 3.98 (.94) | 4.93 (.78) | 3.80 (.98) | 1.90 (.94) | 4.99 (1.70) | 5.47 (1.80) | 4.22 (.92) |
| Incompr./contr. | 3.88 (.62) | 4.61 (.80) | 4.30 (.80) | 1.33 (.61) | 4.82 (1.91) | 5.73 (1.73) | 5.47 (.78) |

*Note*. All scales ranged from 1 to 7, with 7 meaning higher scores on the dimension.

strongly with the claim when information was comprehensible ($EMM = 4.26$, $SE = .11$) than incomprehensible ($EMM = 3.89$, $SE = .09$). Moreover, there was a marginally significant main effect of controversiality, $F(1, 86) = 3.41$, $p = .068$, part. $\eta^2 = .04$, with higher agreement scores in the uncontroversial condition ($EMM = 4.42$, $SE = .11$) compared with the controversial condition ($EMM = 3.93$, $SE = .11$). Finally, we found a significant interaction of comprehensibility and controversiality, $F(1, 86) = 4.89$, $p = .03$, part. $\eta^2 = .05$. Separate $t$ tests for dependent measures showed that only in the uncontroversial condition did participants agree more strongly with claims from comprehensible ($M = 4.53$, $SD = 1.05$) than from incomprehensible texts ($M = 3.90$, $SD = 1.04$), $t(43) = 3.52$, $p = .001$. In contrast, in the controversial condition there was no difference in claim agreement between comprehensible ($M = 3.98$, $SD = .94$) and incomprehensible texts ($M = 3.88$, $SD = .62$), $t(43) = .64$, *ns*. Hypothesis 1a was therefore supported by the data.

### *Perceived Information Credibility*

A mixed ANOVA on Document 1 credibility with the within-participant factor comprehensibility and the between-participant factor controversiality revealed a significant main effect of comprehensibility, $F(1, 86) = 12.78$, $p = .001$, part. $\eta^2 = .13$, due to the comprehensible Document 1 version ($EMM = 4.90$, $SE = .09$) being perceived as more credible than the incomprehensible version ($EMM = 4.52$, $SE = .09$). However, neither the main effect of controversiality nor the comprehensibility $\times$ controversiality interaction were significant, both $F(1, 86) < .63$, *ns*, providing no support for Hypothesis 1b.

For comparison of Document 1 and Document 2 credibility, an additional ANOVA with the within-participant factor comprehensibility and document (Document 1 vs. Document 2) and the between-participant factor controversiality was conducted and showed a significant main effect of document, $F(1, 86) = 64.62$, $p < .001$, part. $\eta^2 = .43$. This was qualified by significant interaction effects of document and comprehensibility, $F(1, 86) = 31.80$, $p < .001$, part. $\eta^2 = .27$, and of document and controversiality, $F(1, 86) = 4.77$, $p = .032$, part. $\eta^2 = .05$. Follow-up $t$ tests for dependent measures showed that Document 2 was generally perceived as less credible; however, descriptive statistics (see Table 1) indicate that the difference between documents was more pronounced in the comprehensible than in the incomprehensible condition and in the controversial compared with the uncontroversial condition (comprehensible, uncontroversial: $t(43) = 4.32$, $p < .001$; comprehensible, controversial: $t(43) = 6.84$, $p < .001$; incomprehensible, uncontroversial: $t(43) = 2.36$, $p = .023$; incomprehensible, controversial: $t(43) = 2.92$, $p = .006$). The remaining main and interaction effects were not significant, all $F < 2.65$, *ns*.

## Confidence in the Agreement Decision

Correlations of preference scores for all three decision strategies revealed that in the comprehensible uncontroversial condition, Strategy 1 (trust in own agreement decision based on present knowledge) was negatively correlated with Strategy 2 (trust in own decision based on further information, $r = -.32$, $p = .03$) and with Strategy 3 (desire to consult an expert, $r = -.59$, $p < .001$). In contrast, Strategy 1 was negatively correlated only with Strategy 3 in the incomprehensible uncontroversial condition ($r = -.38$, $p = .01$), whereas there was no significant correlation in either controversial condition (absolute value of all remaining $r < .28$, *ns*). To test our hypotheses about decision confidence, participants' strategy ratings (from 1 = "don't agree" to 7 = "strongly agree") were subjected to mixed ANOVAs using comprehensibility as within-participant factor and controversiality as between-participant factor.

### *Trust in Own Decision Based on Present Knowledge*

A significant main effect of comprehensibility indicated that the popularity of this strategy was higher in the comprehensible ($EMM = 2.60$, $SE = .14$) than in the incomprehensible conditions ($EMM = 1.72$, $SE = .11$), $F(1, 86) = 51.08$, $p < .001$, part. $\eta^2 = .37$. Moreover, a significant main effect of controversiality revealed the strategy was more favored in the uncontroversial ($EMM = 2.70$, $SE = .16$) than in the controversial conditions ($EMM = 1.61$, $SE = .16$), $F(1, 86) = 23.74$, $p < .001$, part. $\eta^2 = .22$. Finally, there was a significant comprehensibility × controversiality interaction, $F(1, 86) = 6.43$, $p = .01$, part. $\eta^2 = .07$. Follow-up $t$ tests for dependent samples showed that in both controversiality conditions, this strategy was more popular after reading comprehensible than incomprehensible texts (uncontroversial: $t(43) = 5.58$, $p < .001$; controversial: $t(43) = 4.65$, $p < .001$). However, descriptive statistics indicate that the difference between both comprehensibility conditions was larger when the documents were uncontroversial (comprehensible: $M = 3.30$, $SD = 1.66$, vs. incomprehensible: $M = 2.10$, $SD = 1.31$) than when they were controversial (comprehensible: $M = 1.90$, $SD = .94$, vs. incomprehensible: $M = 1.33$, $SD = .61$), lending support to Hypothesis 2a.

### *Trust in Own Decision Based on Further Information*

With regards to the popularity of this strategy, results revealed no significant main or interaction effects, all $F(1,86) < 1.26$, *ns*, hence providing no support for Hypothesis 2b.

### *Desire to Consult an Expert*

There was a significant main effect of comprehensibility, due to this strategy being more popular in the incomprehensible conditions ($EMM = 5.57$, $SE = .18$)

than in the comprehensible conditions ($EMM = 5.31$, $SE = .20$), $F(1, 86) = 5.24$, $p = .03$, part. $\eta^2 = .06$. However, contrary to Hypothesis 2c, controversiality had no influence on participants' willingness to ask an expert, all further $F(1,86) < .97$, *ns*.

## Application of Knowledge in a Communication Situation

Each participant wrote four letters in total (one per topic), with the exception of one participant who provided only one letter and was therefore dropped from the analysis. This resulted in a total number of 348 letters, of which 25% were coded by two independent raters. After interrater agreement had been ensured (for coding of claim agreement: Cohen's $\kappa = .80$, for coding of uncertainty: Cohen's $\kappa = .84$), the remaining 75% were coded by one rater alone. Each letter was coded for occurrence of claim agreement and expression of uncertainty, and the number of occurrences was added for each variable across both letters a participant had written per condition. This resulted in a sum score ranging from 0 (not mentioned in either letter) to 2 (mentioned in both letters). Table 2 shows the average sum scores for both coded variables achieved in each condition. The sum scores were compared between conditions using mixed ANOVAs with the within-participant factor comprehensibility and the between-participant factor controversiality.

### *Expression of Claim Agreement*

A significant main effect of comprehensibility, $F(1, 85) = 26.45$, $p < .001$, part. $\eta^2 = .30$, showed that claim agreement was more often expressed in letters from the comprehensible ($EMM = .87$, $SE = .09$) than incomprehensible conditions ($EMM = .32$, $SE = .06$). Moreover, a significant main effect of controversiality indicated that participants agreed more often with the claim after reading uncontroversial ($EMM = .82$, $SE = .08$) than controversial information ($EMM = .37$, $SE = .08$), $F(1, 85) = .14.37$, $p < .001$, part. $\eta^2 = .15$. Finally, there was a significant interaction of comprehensibility and controversiality, $F(1, 85) = 6.04$, $p = .02$, part. $\eta^2 = .07$. $t$ tests for dependent samples showed that

TABLE 2
Mean Frequency (and Standard Deviations) of Expressions of Claim Agreement and Uncertainty in Participants' Letters as a Function of Comprehensibility and Controversiality

| *Condition* | *Expression of Claim Agreement* | *Expression of Uncertainty* |
|---|---|---|
| Compr./uncontrovers. | 1.21 (.88) | 1.14 (.93) |
| Incompr./uncontrovers. | .43 (.63) | 1.71 (.55) |
| Compr./controvers. | .52 (.73) | 1.51 (.70) |
| Incompr./controvers. | .23 (.48) | 1.81 (.45) |

claim agreement was expressed more often after reading comprehensible than incomprehensible texts in both controversiality conditions (uncontroversial: $t(43) = 5.79$, $p < .001$; controversial: $t(42) = 2.64$, $p = .01$). However, the difference between comprehensibility conditions was larger when the texts were uncontroversial (mean difference = .77, $SD = .89$) than controversial (mean difference = .33, $SD = .81$), lending support to Hypothesis 3.

### *Expression of Uncertainty*

A significant main effect of comprehensibility, $F(1, 85) = 26.01$, $p < .001$, part. $\eta^2 = .23$, indicated that participants more often expressed uncertainty about their recommendation when texts were incomprehensible ($EMM = 1.76$, $SE = .05$) than when texts were comprehensible ($EMM = 1.32$, $SE = .09$). The main effect of controversiality was also significant, $F(1, 85) = 4.12$, $p = .05$, part. $\eta^2 = .05$, showing that uncertainty was expressed slightly more often in the controversial ($EMM = 1.66$, $SE = .09$) than in the uncontroversial condition ($EMM = 1.42$, $SE = .08$). However, in contrast to Hypothesis 4, the comprehensibility × controversiality interaction did not reach significance, $F(1, 85) = 2.43$, *ns*.

## Perceived ETC

To answer the research question whether the influence of comprehensibility and controversiality on persuasion strength and confidence was mediated by perceived ETC, we conducted separate mediator analyses for each combination of independent variable, mediator variable, and dependent self-report variable following the approach of Baron and Kenny (1986) and Judd, Kenny, and McClelland (2001). According to the authors, a variable acts as a mediator if (1) the independent variable affects the assumed mediator, (2) the independent variable affects the dependent variable, and (3) the mediator affects the dependent variable.

To assess whether the first of these preconditions was met, a mixed ANOVA on the ETC scores was conducted with the within-participant factor comprehensibility and the between-participant factor controversiality. The analysis revealed a significant main effect of comprehensibility, $F(1, 86) = 121.79$, $p < .001$, part. $\eta^2 = .59$, with ETC rated as higher in the incomprehensible ($EMM = 5.47$, $SE = .09$) than in the comprehensible condition ($EMM = 4.30$, $SE = .10$). However, neither the main effect of controversiality nor the controversiality × comprehensibility interaction were significant, both $F(1, 86) < .61$, *ns*. With regards to the second precondition necessary for mediation (Judd et al., 2001), the above analyses show that comprehensibility affects all indicators of laypeople's reliance on their own decision and thus indicate that the second requirement for mediation is met for all combinations of independent, mediator, and dependent

variables. Following the approach of Judd et al. (2001), we assessed the fulfillment of the third precondition by regressing the difference between the scores from the comprehensible and incomprehensible condition of each dependent measure onto the sum and difference of ETC ratings from both comprehensibility conditions. According to Judd et al. (2001), a significant difference predictor would indicate ETC to act as a mediator, whereas a significant sum predictor would show the variable to moderate the effect of comprehensibility on the dependent measure. Because none of the regression models reached significance, all $F(2,41) < 3.23$, *ns*, ETC perceptions do not appear to mediate (or moderate) the observed effects of either comprehensibility or controversiality.

## DISCUSSION

By presenting medical laypeople with text information that varied in comprehensibility and controversiality, the present experiment assessed the combined influence of both text features on recipients' reliance on their own ability to make a medical claim-agreement decision. Moreover, we aimed to gain insight into the possible process through which both text features affect laypeople's self-reliance.

### Summary and Interpretation of Present Findings

Document 1 was generally perceived to be less comprehensible than Document 2. One possible explanation is that at the time of reading Document 2, participants had already been introduced to the topic through Document 1 and thereby had acquired some prior knowledge which may have facilitated their comprehension.

The findings further revealed, in line with our expectations, that lay recipients agreed more strongly with claims from comprehensible than incomprehensible texts on a self-report measure. These results corroborate previous research showing greater persuasiveness of comprehensible information (Eagly, 1974; Scharrer et al., 2012), but they go beyond these past findings by demonstrating that the persuasive influence of comprehensibility is reduced when information is controversial. It seems that encountering controversial information makes laypeople more cautious about agreeing with a claim even if the information is easy to comprehend.

The findings regarding perceived information credibility revealed that whereas comprehensible information was regarded as more credible than incomprehensible information, controversiality had no impact on credibility evaluations. Comparing ratings of both documents, we found that Document 2 was generally perceived as less credible than Document 1. Apparently, the differences in content between the documents (i.e., only Document 1 containing a

causal explanation) led participants to discount Document 2 credibility despite its high comprehensibility. This finding is in line with previous research showing that type of claim support influences persuasiveness in addition to information comprehensibility, with causal explanations being particularly persuasive (Scharrer et al., 2012). The fact that differences in credibility between both documents were more pronounced for comprehensible than for incomprehensible texts suggests that participants' comprehension success encouraged them to more strongly dismiss the document they deemed to contain a weaker type of claim support. Moreover, participants appeared to be more inclined to dismiss claim support they considered comparably weak if its validity was called into question by a competing document. Nevertheless, participants did not increase their ratings of Document 1 despite discounting Document 2's credibility.

Overall, the results regarding the persuasion measures indicate a partial difference between participants' claim agreement and Document 1 credibility. Controversiality mitigated the comprehensibility effect on claim agreement but not on credibility. An explanation that may account for the difference is that laypeople may distinguish between what they consider as objectively credible and what they personally accept as true. Thomm and Bromme (2012) recently proposed that although laypeople may be aware of what counts as credible by standards of "official science," they may not necessarily incorporate this into their own subjective beliefs (see also Chinn & Samarapungavan, 2001). In this case, credibility would not represent an appropriate indicator of personal persuasion when it comes to science-based information.

With regards to laypeople's confidence in their claim-agreement decisions, the strategy to decide based only on one's present knowledge, which should be indicative of high decision confidence, was more popular in the case of comprehensible than incomprehensible texts. However, similar to the state of affairs regarding claim agreement, the influence of comprehensibility was more pronounced when information was uncontroversial. Contrary to our expectations, we found no influence of either comprehensibility or controversiality on the strategy of deciding on one's own based on further topic information. It is noteworthy that laypeople rated this strategy as very popular in all experimental conditions. Perhaps laypeople are generally inclined to look for further information rather than basing a decision only on two short documents, regardless of information comprehensibility and controversiality. Also contrary to our expectations, controversiality had no influence on electing to consult an expert for support, indicative of low decision confidence. Comprehensibility did affect laypeople's desire to ask an expert, with this strategy being more popular in the incomprehensible conditions. This latter finding is in line with results by Scharrer et al. (2012). However, it is surprising that information controversiality had no effect on selection of this strategy. When information is incomprehensible, laypeople are willing to consult an expert regardless of controversiality.

In the case of comprehensible conflicting information, laypeople may feel encouraged to determine by themselves which of both positions is correct, for instance, by seeking out further information. Therefore, their willingness to ask an expert in this condition might not be substantially higher than in the case of comprehensible uncontroversial information. On a descriptive level, however, it is interesting that the strategy to consult an expert tended to be preferred over the strategy to decide by oneself based on further topic information when the provided information was controversial but not when it was uncontroversial. In the latter case, both strategies appeared to be equally popular. Perhaps laypeople tend to believe that deciding about controversial issues requires a level of knowledge which exceeds that necessary for validating uncontroversial claims and can therefore hardly be obtained through further information search. Taken together, it seems that both comprehensibility and controversiality influence laypeople's decision confidence. However, their effects manifest differently on the three decision strategies.

Results regarding decision confidence also reveal that across conditions the strategies of deciding based on further information and consulting an expert are more popular than the strategy of deciding based on given information. This might indicate a sensible hesitance on the part of our participants to confidently agree with a claim based only on two Internet documents. The comparably high ratings of the strategy of consulting an expert furthermore indicate that our participants tended to recognize their dependence on experts, although this recognition seems to have been diminished if they received comprehensible information. The correlation patterns of the three decision strategies suggest that laypeople's strategy preferences are most clearly distinguished if information is comprehensible and uncontroversial. In this case, laypeople who prefer to decide based on the read information appear to have a correspondingly low desire to search for further information or ask an expert (and vice versa). In contrast, if information is controversial and/or incomprehensible, laypeople seem to differ in their preference of alternative strategies: Some individuals who do not feel ready to decide at their present knowledge level may hope to reach a decision through further reading, whereas others may be more generally discouraged and expect further topic information to be equally incomprehensible or inconsistent. Still others might opt for a combination of seeking out further content information and expert advice.

The results achieved on the self-report measures are largely corroborated by laypeople's communication behavior. Analyses of participants' letters showed that claim agreement was expressed more often after reading comprehensible than incomprehensible texts. However, similar to the findings obtained on the self-report-measure of claim agreement, this difference was larger when the documents were uncontroversial. Furthermore, comprehensibility and controversiality influenced the likelihood of participants expressing uncertainty about

their recommendation. Expressions of uncertainty were more frequent when documents were incomprehensible or controversial. However, in contrast to our expectations, the influence of comprehensibility was not mitigated when the information was controversial.

Our second goal was to gain insight into the possible process through which comprehensibility and controversiality affect laypeople's self-reliance. We found that the influence of neither information feature is mediated by perceived ETC. It is possible, however, that our measures were not adequately sensitive to this relationship. Our measure of perceived ETC may have captured the intended construct too globally. Rather than assessing one overall score of perceived ETC, it might be worthwhile to divide the construct into two components, namely perceived structural complexity of topic knowledge and difficulty of handling topic knowledge. A differentiated measure might have revealed that one but not the other component mediates the observed effects. Future research could apply a more fine-grained assessment of ETC perceptions to investigate this possibility.

A second possible explanation is that laypeople simply do not elaborate on the epistemic demands of the problem at hand. As pointed out previously, incomprehensible and controversial information should both lead to a disruption of coherence formation. If laypeople regard a coherent representation as a prerequisite for decision-making (i.e., if they believe that only a coherent representation is a sufficient basis for deriving decisions), this would account for the observed moderation effects. Similarly, information that cannot be represented coherently may be regarded as more likely to be false. This should be the case if recipients doubt that incoherent factual information can correctly describe the coherent world (Mercier, 2012). Alternatively, recipients' self-reliance might be based on affective reactions. Schwarz (2004) proposed that fluent comprehension triggers positive affective reactions, which should translate to more favorable text evaluations such as its truth value. Overall, the mechanisms underlying the influences of comprehensibility and controversiality remain subject to further empirical clarification.

## Limitations and Future Directions

When interpreting the results, potential limitations should be considered. First, the present research was focused on medical topics. Previous research on laypeople's persuasion through science-based information has shown that findings are to a large extent generalizable across domains (Scharrer et al., 2012; Thomm & Bromme, 2012). Nevertheless, future research might investigate the applicability of the present results to other scientific domains.

It should furthermore be noted that as a first step in assessing the combined influence of comprehensibility and controversiality on laypeople's decisions, we chose an experimental setting and task that would allow us to control for any

unintended influencing factors. Future research could inspect the ecological validity of the present findings by investigating more naturalistic scenarios in which additional variables that may affect laypeople's decisions in "real life" are accounted for (e.g., emotion towards/personal relevance of the claim, perceived cost of effort of consulting an expert). Related to this, by establishing laypeople's sensitivity toward variations in comprehensibility and controversiality, we have shown a possibility to act in a certain way in response to both factors. To assess how laypeople put this possibility into practice, future studies could introduce behavior measures and provide the opportunity to actually search for further information or ask experts after reading.

It should also be considered that the conflicting nature of the received information in the controversial conditions was explicitly pointed out to participants. Previous research has shown that readers do not always detect conflicts between texts spontaneously (Stadtler, Scharrer, & Bromme, 2011; Stadtler, Scharrer, Brummernhenrich, & Bromme, 2013). In this initial investigation into the interplay of comprehensibility and controversiality, we were interested in how controversiality influences laypeople given that they have indeed recognized the inconsistency between documents. Therefore, we decided to apply an obvious manipulation of controversiality. If we had not pointed out the conflicting nature of information, we would not have been able to ascertain whether the results reflected laypeople's reaction to recognized conflict or their (in)ability to detect conflict in the first place. However, it should be kept in mind that the moderating effect of controversiality currently observed is based on the precondition that readers actually recognize the information as conflicting. Whether the effect is comparably pronounced if a more subtle manipulation of controversiality is applied remains subject to further research.

Another potential limitation pertains to our measure of laypeople's decision strategy choice. As noted previously, we do not consider the three decision strategies as mutually exclusive alternatives. However, we did not explicitly state that participants could combine the different strategies. We decided against such specification to reduce the likelihood of a demand effect, inspiring participants to provide high ratings to all strategies when they would not have done so spontaneously. This approach, however, entails the possibility that our participants may have differed slightly in the interpretation of the strategy preference question, some considering the strategy choice as mutually exclusive and others perceiving the strategies as combinable. For comparison, future research could apply a more specific task instruction to prevent this potential unwanted source of variance and by this means may obtain even stronger strategy effects.

The present experiment was conducted on a student sample and therefore on well-educated laypeople. Their general academic competence may have made our participants more inclined to seek out further content information or expert

advice before making a decision compared with laypeople without an academic background. In fact, we consider it remarkable that even individuals who by experience should to some degree be aware of the challenges involved in evaluating scientific knowledge are apparently prone to the "seductive" effect of high comprehensibility and uncontroversiality of provided information, leading them to discount their epistemic limitations. Of course, in many situations, successfully comprehending information makes reliance on one's own decisions easier and more warranted. However, this does not apply to the special case when laypeople are confronted with expert information. Here, the comprehension of a fragment of topic information by no means qualifies for a competent decision about information validity or sufficiency—a state of affairs of which students should be expected to have some awareness. Our focusing on a student sample, however, may be a reason why the observed effects of controversiality were partly inconsistent. Because of their academic experience, participants might have been aware that controversy is a usual occurrence in science knowledge development and did not therefore consider it as a cue for low credibility. Although the presently obtained effects might look different for laypeople without an academic background, we consider it a strength of our study that by focusing on well-educated laypeople, the results inform about the social group most likely to retrieve scientific online information to back up decisions (e.g., Fox, 2005).

Finally, the current experiment represents only a first step in investigating the possible mechanism(s) that might underlie the influence of comprehensibility and controversiality on laypeople's reliance on their own decision. Further research is necessary to examine whether factors other than ETC, such as affective reactions, underlie the observed impact of comprehensibility and controversiality, for example, by applying think-aloud methodology (Ericsson & Simon, 1993).

## Educational Implications

Our findings have implications for the communication of science-based knowledge to laypeople in informal learning contexts. Although simplified science reports have the advantage of providing laypeople insight into scientific issues that are important for their everyday lives, such easy-to-comprehend information may lead laypeople to overestimate their own decision-making ability and refrain from consulting an expert (see Scharrer et al., 2012). The present results suggest that when scientific findings are communicated to laypeople, the inclusion of information about related controversies can serve to weaken the comprehensibility effect. This is of particular importance, given that popularized science depictions not only use simplified language, but often omit information about related findings and thus about potential

controversies (Zimmerman, Bisanz, Bisanz, Klein, & Klein, 2001). In light of the present findings, we consider it paramount that authors of popularized reports put greater effort in increasing awareness of controversy when it truly exists.

This demand is in accordance with the proposition that confronting and engaging individuals with scientific controversies represents an effective and recommendable (yet mostly neglected) method to advance critical thinking and conceptual understanding of science (Mason, Boldrin, & Ariasi, 2010; Osborne, 2010). In his plea for promoting students' critical scientific literacy, Hodson (2008, p. 35) pointed out the value of confronting learners with primary research literature that reveals the inconsistency and controversy typical of scientific knowledge. According to Hodson, this should foster students' understanding of the extent to which scientific knowledge can be relied on. Our current findings suggest that this also applies to adults who have to cope with scientific evidence in situations they do not conceive of as learning contexts. Hence, becoming acquainted with the prevalence of conflict in science is of great importance not only in formal science education but also in the context of informal engagement with science through popularized science depictions.

## ACKNOWLEDGMENTS

We are grateful to Jasmin Hettinger, Stephanie Sievers, and Nikolai Wystrychowski for their help with data collection and preparation. This research was supported by the Deutsche Forschungsgemeinschaft (DFG), Grant BR 1126/6-2 provided to the 3rd and 4th authors of this article, and by the Institute of Education Sciences, U.S. Department of Education, through Grant R305F100007 provided to the 2nd author of this article.

Part of this work was published as a contribution to the 34th annual meeting of the Cognitive Science Society, 2012, Sapporo, Japan.

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