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THE ROLE OF VALIDATION IN INTEGRATING MULTIPLE PERSPECTIVES

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ABSTRACT

The Internet is the primary source of information about a broad range of topics, which may range from consumer and medical decisions to political and socio-scientific issues. The relevant information is often available in the form of written texts that convey divergent perspectives, such as different opinions, competing theoretical assumptions, arguments and counterarguments, and evidence and counterevidence. What are the challenges and potential problems associated with comprehending texts that convey multiple perspectives? How can students be supported to make the most of this obviously complicated reading situation? This chapter attempts to answer these questions from a particular theoretical perspective that revolves around the notion that readers routinely validate text information against pertinent and accessible knowledge and beliefs. We will discuss how validation acts in concert with the two other major component processes of text comprehension, activation and integration. This discussion will be followed by an outline of the Two-Step Model of Validation, a model that makes predictions about circumstances that enable or hinder readers in forming a coherent and consistent mental representation based on multiple perspectives.

Key words: beliefs, comprehension, integration, multiple texts, validation

In this digital age, information about almost everything is available for almost everyone at one's fingertips. The Internet is the primary source of information whenever we wish to know more about a topic, which may range from consumer (e.g., *Should I buy this new smartphone?*) and medical decisions (e.g., *Should my child have this vaccination?*) to political and socio-scientific issues (e.g., *Should nuclear power plants be shut down?*). In most cases, the relevant information is available in the form of written

texts and these texts often convey divergent perspectives, such as different opinions, competing theoretical assumptions, arguments and counterarguments, and evidence and counterevidence. How readers make sense of multiple perspectives is a highly relevant theoretical question but also a pressing issue for educational practitioners. What are the challenges and potential problems associated with comprehending texts that convey multiple perspectives? How can students be supported to make the most of this obviously complicated reading situation?

This chapter attempts to answer these questions from a particular theoretical perspective that revolves around the notion that readers routinely monitor the plausibility of text information with pertinent and accessible knowledge and beliefs (*validation*, Richter, 2015; Singer, 2013). Proceeding from single to multiple text comprehension, we will discuss how validation acts in concert with the two other major component processes of text comprehension, activation and integration. This discussion will be followed by an outline of the Two-Step Model of Validation, a model that relies on the notion of validation to make predictions about circumstances that enable or hinder readers in forming a coherent and consistent mental representation based on multiple perspectives (Richter & Maier, 2017). The Two-Step Model of Validation assumes that, per default, this representation is bound to be biased towards readers' prior beliefs in the form of a better comprehension of belief-consistent texts compared to belief-inconsistent texts (text-belief consistency effect). However, the model also specifies conditions that support readers to construct a mental representation of multiple perspectives that includes belief-consistent and belief-inconsistent information to a similar extent. These conditions have certain educational implications, especially for the design of training interventions that might help readers to successfully comprehend multiple texts in terms of reducing the preferential processing and comprehension of belief-consistent and plausible information.

THREE MAJOR COMPONENT PROCESSES OF COMPREHENSION: ACTIVATION, INTEGRATION, AND VALIDATION

When readers comprehend a text, they use the information in the text and their prior knowledge to construct a more or less complete mental representation of what the text is about. This type of referential representation has been termed a situation model or mental model, which can be distinguished from (although it is based on) the representation of the text itself and its propositional content (van Dijk & Kintsch, 1983). Situation models are built, enriched, and updated continuously as a reader moves forward in a text. In this process, the words and larger segments of a text function as retrieval cues that passively activate information from long-term memory (through a resonance-like mechanism, O'Brien & Myers, 1999). The activated information can be based on previous portions of the text (contextual information) or on prior knowledge and beliefs. New information from a text is then integrated with the activated information to form a situation model of the text content. Integration is usually described as a passive, text-driven process that is based on semantic associations between information from the text and information in long-term memory. For example, the Construction-Integration model (Kintsch, 1988) assumes a spreading activation process that is iterated until the network of propositions from the text and from prior knowledge reaches a stable pattern. Propositions with many connections are strengthened and remain active in the reader's situation model, whereas

propositions with few connections are weakened and are eventually deactivated. The integration mechanisms result in a network of interconnected propositions from the text and from prior knowledge, which together form the current situation model.

This now classical notion that comprehension is largely based on passive activation and integration processes has proven to be quite powerful for explaining experimental findings and designing useful applications (for an overview, see McNamara & Magliano, 2009). However, its limits become apparent when a reader encounters text information that conflicts with the contents of the current situation model. For example, O'Brien, Rizzella, Albrecht, and Halleran (1998) presented readers with short narratives that introduced a character (e.g., *Mary is a vegetarian*). When later on in the narrative that character performed actions that contradicted the initial description (e.g., *Mary ordered a cheeseburger*) and the initial information is still active (or reactivated), reading times were increased. This and many similar findings obtained with this inconsistency paradigm have traditionally been interpreted as integration difficulties but they seem to reflect more than that: Apparently, readers possess a mechanism that checks the consistency of text information with the contents of the current situation model and accessible background knowledge. Singer, Halldorson, Lear, and Andrusiak (1992) have coined the term *validation* to refer to this mechanism.

An increasing number of researchers have adopted the idea that the commonly known dyad of basic and passive comprehension processes is in fact a triad, consisting of activation, integration, and validation (Isberner & Richter, 2014a; Richter, 2015; Richter & Singer, 2017). For instance, O'Brien and Cook (2016) proposed the Resonance-Integration-Validation Model (RI-Val) that describes how activation, integration, and validation act in concert during reading. The model proposes that after a certain amount of knowledge has been activated in the course of reading, integrating the activated knowledge with the text information begins. After the integration process has achieved a sufficient conceptual overlap between activated knowledge and text information, the activated, integrated information is validated against activated relevant background knowledge. Once the validation process has established a certain coherence threshold, the reader moves on in the text.

The general assumption that readers routinely validate information against active parts of their prior knowledge and the discourse context is supported by a wealth of evidence from reading time and eye-tracking experiments, studies with event-related potentials, and experiments based on the epistemic Stroop paradigm (for an overview, see Isberner & Richter, 2014a). The latter is particularly informative because it shows that validation entails the rejection of false or implausible information and, hence, goes beyond mere integration problems. In the epistemic Stroop paradigm, participants read words presented one-by-one in rapid succession (e.g., 300 ms per word) on a computer screen (Richter, Schroeder, & Wöhrmann, 2009). The words successively form sentences that can be true (e.g., *Libraries have books*) or false (e.g., *Computers have emotions*). The presentation stops at the word in the sentence at which the truth value of the sentence can, in principle, be computed. At this point, participants are prompted to provide a binary response for a task that is unrelated to the content of the sentence or the semantics of the word. For example, they can be asked to judge whether the word is spelled correctly (Richter et al., 2009). When the experimental sentence is false (*Computers have emotions*), but the required response (prompted at the word *emotions*) is "yes" (because the word is spelled correctly), participants' responses are slowed down as compared to

true sentences (e.g., *Libraries have books*). This epistemic Stroop effect seems to be very robust. It has been shown with different tasks, for example, spelling judgments (like in Richter et al., 2009), judgments about whether the word has changed color (Isberner & Richter, 2013, Experiment 2), or simple reactions to the probe words TRUE or FALSE with the appropriate key (Isberner & Richter, 2014b). It has also been shown with different types of materials, including true vs. false sentences (like in Richter et al., 2009), sentences that are plausible vs. implausible in the discourse context (e.g., *Frank has a broken leg. He calls the* doctor/plumber; Isberner & Richter, 2013), or deictic sentences (e.g., *This is a car*) presented auditorily together with a matching or mismatching picture (Piest, Isberner, & Richter, 2018). In sum, the epistemic Stroop effect obtained across these different tasks and materials strongly suggests that comprehenders routinely and involuntarily validate linguistic information. Moreover, it suggests that information that is inconsistent with readers' prior knowledge or their beliefs, evokes a negative response tendency, that is, a tendency to give a "no"-response in an unrelated task.

If validation is indeed a routine component of comprehension as suggested by the presented research, it is likely to serve comprehension in relevant ways. The negative response tendency allows for the conclusion that one of these functions is to assist readers to build and maintain coherent and internally consistent mental representations during comprehension by detecting and rejecting information that does not fit into the current mental model. In line with this reasoning, Schroeder, Richter, and Hoever (2008) have shown that, for the comprehension of expository texts, implausible information is less likely to be integrated into the situation model of the text content. On the other hand, information that is part of the situation model is more likely to be judged as plausible. Similarly, a strong link between the perceived plausibility of information and its integration into the situation model has been found for multiple text comprehension (Maier & Richter, 2013a). The strong relationship between plausibility and the situation model constructed during reading suggests that validation and integration work in concert during comprehension. How this collaboration can be described for the case of comprehending multiple perspectives will be discussed in more detail next.

INTEGRATION AND VALIDATION IN THE COMPREHENSION OF TEXTS CONVEYING MULTIPLE PERSPECTIVES

Integration is more demanding if texts convey multiple perspectives. For example, when readers read multiple texts dealing with the same topic but from different angles, they need not only to integrate text information with their prior knowledge and earlier parts of the text, but also with information from the other text(s).

Sometimes, single texts offer different perspectives, for example, when a text cites different sources, such as a textbook describing competing theoretical explanations of the same phenomenon. Regardless of whether multiple perspectives are presented in multiple texts or in single texts, they necessitate readers to update their situation model and shift to a new representational structure (Gernsbacher, 1990) because seamless integration into the existing situation model is not possible. Validation might serve an important function in this process as it signals to the reader the need for updating (Richter & Singer, 2017).

On a general level, two types of reading situations involving multiple perspectives may be distinguished, depending on whether the different parts of a text or, more

often, multiple texts present componential or conflicting information (e.g., Bråten, Braasch, & Salmeron, in press). The role of validation and its interplay with integration differs between these types of situations, as described next.

Integration and Validation in Multiple Texts Presenting Componential Information

The *componential reading situation* may be illustrated by a reader gathering information about a specific topic or question and reading several texts that provide partly overlapping but also unique information. It resembles a puzzle that readers need to solve by finding matching pieces and putting them together in the right way. An experiment by Cerdán and Vidal-Abarca (2008) sheds light on the specifics of this situation. They provided undergraduate students of psychology three longer texts about antibiotics resistance (length 390–684 words), each covering different aspects of the topic. Cerdan and Vidal-Abarca found that comprehension depended on the task they gave to their participants: An intertextual task (writing an essay on a question that required participants to refer to all three texts) that promoted the integration of information across texts lead to superior performance, as compared to an intratextual task that directed readers to focus on single texts (answering intratextual questions). Moreover, participants given the intertextual task spent more time reading relevant parts of the text and went back and forth between texts more frequently than participants given the intratextual task. Hence, in this componential reading situation participants assigned to the intertextual task integrated different matching pieces of information across texts and were able to combine these more successfully into a complete picture of the issue, as compared to participants assigned to the intratextual task.

In a componential reading situation, the effects of validation often do not become explicitly apparent. However, that is not to say that validation does not play a role. Rather, the validation process works in the background and continuously evaluates the consistency of ideas from the text with activated information. In such a reading situation, validation might create the prerequisites for updating by signaling to the reader when a piece of information does not fit into the current situation model (Richter & Singer, 2017) and whether a new structure has to be initiated. For example, in the study by Cerdán and Vidal-Abarca (2008), readers might have used validation to determine whether information presented in a later text about the "Genetics of bacteria resistance" fits into the situation model constructed during reading the previous text on "New perspectives on bacteria resistance". If validation determines that the information presented in the second text does not fit into the current situation model based on the first text, the construction of a new situation model is initiated. Similar, validation might also signal to the reader to reread specific information, for example from a previously read text. Apparently, successful integration, at least across longer texts in an authentic reading situation, goes beyond the passive integration as described by the Construction-Integration model (Kintsch, 1988) or the RI-Val model (O'Brien & Cook, 2016). Rather, it seems to be strategic to some extent and to require cognitive effort and validation processes, as indicated by the longer reading times on task-relevant portions of the texts in the study from Cerdán and Vidal-Abarca (2008).

Integration and Validation in Multiple Texts Presenting Conflicting Information

In a *reading situation involving conflicting information*, validation plays a more conspicuous role because readers are more likely to encounter information that is inconsistent with previously read information or their prior beliefs. Many studies in the field of multiple text comprehension have focused on the comprehension of texts that convey (partly) conflicting information. For example, the seminal work by Rouet, Britt, Mason, and Perfetti (1996) and Britt, Perfetti, Sandak, and Rouet (1999) involved students reading multiple and partially conflicting historical documents and secondary texts about a historic event, the US occupation of the Panama Canal. These texts represented different perspectives of American politicians, historians, and Panamanians. Other studies followed their lead using multiple texts representing different and partially conflicting perspectives on (socio-)scientific issues such as climate change (e.g., Maier & Richter, 2013a; McCrudden & Barnes, 2016), vaccinations (Maier & Richter, 2013b), the link between violent computer games and aggression (van Strien, Brand-Gruwel, & Boishuizen, 2014) or health risks caused by the electromagnetic radiation caused by cell phone use (e.g., Anmarkrud, Bråten, & Strømsø, 2014; Maier & Richter, 2016). These topics are controversially debated in public and readers who search the Internet to learn more about any of them are likely to encounter texts that present arguments and counterarguments, contrary evidence, and conflicting information, which is often due to differences in perspective.

The first question to ask is whether readers notice multiple perspectives at all when they read a text. There is evidence that they do, at least if the conflicting information is presented closely enough so that the earlier information is reactivated, and that differences in perspective may play a role in resolving such conflicts. For example, Braasch, Rouet, Vibert, and Britt (2012) conducted an eye-tracking experiment with two-sentence news articles in which two people (e.g., an art critic vs. a lighting technician) made claims about various topics (e.g., an opera show). The claims were either consistent or inconsistent with one another. Braasch et al. found that discrepant news reports lead to more and longer fixations on source information, i.e. the person making the claim, and a better memory for that information. Hence, participants in this study did notice the multiple perspectives in the texts. The authors interpret these findings in light of the Discrepancy-Induced Source Comprehension assumption (D-ISC), according to which readers who encounter discrepant or inconsistent information in a text become more attentive to sources, possibly in an attempt to resolve the discrepancy. Similarly, experiments by Beker, Jolles, Lorch, and van den Broek (2016) show that readers monitor the consistency of information even across texts. Beker et al. used a multiple-text version of the inconsistency paradigm with pairs of short expository texts (average length of five to six sentences) on different topics. Using this paradigm, they showed that reading times were prolonged for target sentences in the second text when these were inconsistent (as opposed to consistent) with information in the sentence preceding the target sentence. Again, such a finding indicates readers' awareness of multiple perspectives. Importantly, however, the slowdown in inconsistent target sentences did not occur when an explanation resolving the inconsistency had been provided in the first text. This finding suggests that readers spontaneously activated information from previously read texts and validated the consistency of information across texts. However, it must be noted that the texts used in the experiments by Beker et al. were very short, implying that information from Text 1 and Text 2 were read

shortly after one another, which provides quite favorable conditions for the activation of information from Text 1 while reading Text 2.

If readers are affected by inconsistencies even across texts, how is it possible for them to achieve a coherent and consistent mental representation from texts presenting multiple perspectives with conflicting information? When the information comes from multiple texts, the ideal reader would integrate conflicting information by forming a documents model (Perfetti, Rouet, & Britt, 1999), a complex mental representation that contains a more or less complete situation model for each individual text plus an intertext model that includes source information (e.g., information about the author(s), the publication date, publication type, and outlet) and the argumentative relationships between the texts. Moreover, the ideal reader would use the source information to judge the credibility of texts and weigh the information accordingly. Likewise, the ideal reader would judge the quality of the arguments presented in each of the texts to arrive at an informed and justified point of view. Although the documents model has been proposed as a representational framework for multiple text comprehension, a similar type of representation seems suitable also for building a representation of the context of a single text that describes multiple perspectives, for example, a scientific text describing multiple theoretical viewpoints, which are ascribed to different sources (i.e., scientists).

There is evidence, for example from the study by Braasch et al. (2012), that readers indeed use source information to resolve information conflicts when that information is readily available. And, of course, readers sometimes also evaluate the quality of arguments presented in a text to arrive at an informed and justified point of view. However, they do not seem to engage in these processes routinely. For example, research on multiple texts has shown that readers by no means regularly attend to source information (e.g., Britt & Aglinskas, 2002), often do not use this information properly for judging text credibility (e.g., von der Mühlen, Richter, Schmid, Schmidt, & Berthold, 2016a), and do not properly evaluate the quality of the presented arguments (von der Mühlen, Richter, Schmid, Schmidt, & Berthold, 2016b). Most important in the present context, readers frequently adopt certain positions in such controversies, holding strong beliefs about what is true or false (or what is right and wrong), and these beliefs can affect their comprehension of texts conveying multiple perspectives. For example, most people are either pro or contra nuclear power but they typically know very little about the potential risks and safeguards in effect for nuclear reactions, not to mention the underlying physical processes. These beliefs affect comprehension of multiple texts. In particular, readers' situation models are biased towards their prior beliefs, with stronger situation models for texts conveying belief-consistent as compared to belief-inconsistent information (Maier & Richter, 2013b). In the following section, we will sketch a model that can account for this text-belief consistency effect and place it in a broader context of the role of validation in the comprehension of multiple perspectives.

THE TWO-STEP MODEL OF VALIDATION: HOW READERS COMPREHEND CONFLICTING INFORMATION IN MULTIPLE TEXTS

Richter and Maier (2017, 2018) have proposed the Two-Step Model of Validation to describe the cognitive processes involved in the comprehension of multiple texts with conflicting information (for a preliminary version of the model, see also Richter, 2011). One aim of this model is to explain the text-belief consistency effect i.e., the better

comprehension of belief-consistent as compared to belief-inconsistent information (Maier & Richter, 2013b), which is regarded as a consequence of routine validation processes during comprehension. The Two-Step Model of Validation has been formulated to explain belief-biases in the comprehension of multiple texts on controversially debated issues, but in principle, the model applies to single texts conveying multiple perspectives as well. We view the processes described in the Two-Step Model of Validation as fundamental to how readers make sense of text conveying multiple perspectives, whenever they possess strong and accessible prior beliefs towards an issue.

The basic idea of the Two-Step Model of Validation is that routine validation enables readers to maintain a coherent and consistent mental representation of controversial topics without the need to invest much cognitive resources. However, such processing comes at the costs of a one-sided mental representation, in which belief-inconsistent information is integrated to a lesser extent. A second aim of the model is to account for conditions that are known to moderate the occurrence of the text-belief consistency effect.

In particular, Richter & Maier (2017) propose that two steps may be involved in readers' comprehension of texts with multiple perspectives (Figure 16.1). Step 1 is obligatory and demands little cognitive resources because it relies solely on routine and passive comprehension processes, i.e. the triad of activation, integration, and validation of information during reading. When readers possess strong and accessible beliefs about a controversial issue, these beliefs will be used to validate text information, which may lead to a belief bias in the comprehension of multiple texts (see next section for details). Step 2 is optional, resource demanding and depends on the specific goals of the reader. When readers undertake this step, they engage more strongly in elaborative processing of information that might be able to reduce detected inconsistencies between texts conveying multiple perspectives. In most cases, this will include
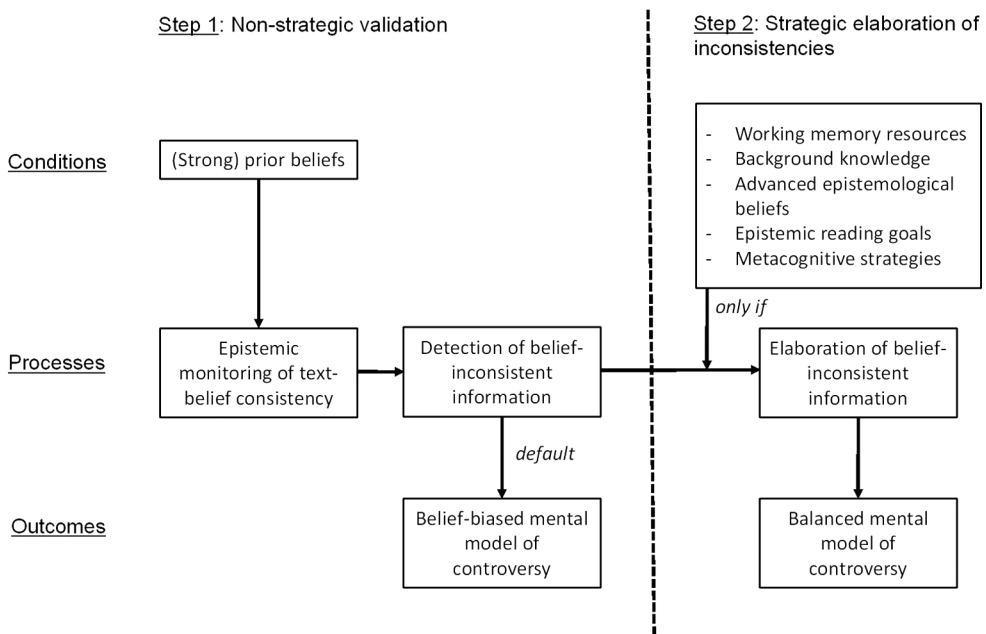

Figure 16.1 The Two-Step Model of Validation in multiple text comprehension.

better processing of belief-inconsistent information, as such information was processed to a lesser extent due to the monitoring process of Step 1 as outlined in the next section. Nevertheless, belief-consistent information might be additionally processed to resolve inconsistencies during Step 2. The elaborative processing of Step 2 requires certain conditions to occur, which will be outlined in the next sections. Arguably, elaborated processing increases the chances that belief-inconsistent information is integrated into the mental representation of a controversial issue.

Step 1: Routine Validation of Conflicting Information Based on Prior Knowledge and Beliefs

Being a passive process, validation occurs regardless of readers' goals; it is an integral component of comprehension (Isberner & Richter, 2014b; O'Brien & Cook, 2016). During this routine validation, text information is monitored for consistency with the current situation model and with the contents of long-term memory that are activated through concepts and propositions in the text. For the comprehension of single as well as multiple texts on controversial issues, it is important that validation can be based not only on prior knowledge but also on prior beliefs. Research on argument comprehension has shown that readers holding pertinent and accessible beliefs are as fast to evaluate a claim as they are to comprehend it (Voss, Fincher-Kiefer, Wiley, & Silfies, 1993). Moreover, using the epistemic Stroop paradigm, Gilead, Sela, and Maril (2018) have shown that claims that are consistent or inconsistent with participants' beliefs (e.g., *The Internet has made people more* isolated/sociable) elicit the same negative response tendencies as false or implausible statements. This result suggests that readers' prior beliefs are also reactivated and used for validation, alongside knowledge, without readers' strategic attempts to do so. Moreover, these results suggest that validation continuously generates implicit plausibility judgments based on the consistency of new information with readers' prior beliefs as a by-product of comprehension.

The Two-Step Model of Validation assumes that in the comprehension of multiple perspectives, these implicit plausibility judgments serve as a kind of heuristic that helps readers to regulate their cognitive resources during reading and to maintain a coherent and consistent situation model. Per default, readers tend to process information perceived as plausible more deeply than information that they find less plausible. On a global level, this mechanism leads to a text-belief consistency bias in multiple documents comprehension (Maier & Richter, 2013a): Situation models for texts that are consistent with one's own beliefs in a controversy are stronger than those for belief-inconsistent texts. On a local level, it leads to a plausibility bias (Maier & Richter, 2013b): Belief-consistent information in a text is integrated more easily than belief-inconsistent information.

Both the (global) text-belief consistency effect and the (local) plausibility bias seem to be robust findings that occur in different groups of readers, from adolescents to university students, and with different topics and comprehension tasks (for a systematic review of the text-belief consistency effect, see Richter & Maier, 2017). For example, Maier and Richter (2013b) found a stronger situation model (measured with an inference recognition task) for belief-consistent compared to belief-inconsistent texts when university students read four multiple texts arguing for opposing positions with regard to global warming (man-made vs. natural causes) and vaccinations (more benefits

vs. more risks) in a blocked fashion (first two texts on one position, then two texts on the opposing position). These results have been replicated in a sample of adolescents (Abendroth & Richter, 2019). Other studies have used essay-writing tasks. For example, Anmarkrud et al. (2014) presented undergraduates with six texts providing different views on whether the use of cell phones is associated with health risks. Most participants wrote essays that contained only reasons in support of their own position but did not provide any counterarguments or arguments for an alternative position. A third method that has been used in studies on text-belief consistency effects to measure comprehension outcomes is argument evaluation. An experiment by Kobayashi (2010, Experiment 1) is a case in point. Japanese undergraduates read texts that argued for or against the introduction of daylight savings time in Japan and rated the convincingness of the arguments presented. Belief-consistent arguments were rated as more convincing than belief-inconsistent arguments. Moreover, the argument's evaluation was correlated with the pro- and con-arguments in a subsequent essay task. The more participants were in favor of daylight savings time the fewer favorable statements they produced in response to the counterarguments provided in text. Thus, Kobayashi also found a link between the consistency of information with readers' prior beliefs and the perceived plausibility of such information, as well as with the (im)balance of the resulting mental representation of the controversy (similar to Maier & Richter, 2013b; Schroeder et al., 2008). In sum, these results are in line with the assumption of the Two-Step Model of Validation that readers per default process belief-inconsistent information in a shallower manner when reading multiple texts on conflicting information.

The first step of the Two-Step Model of Validation, with its assumption that readers use a plausibility (or belief-consistency) heuristic to regulate comprehension and the construction of situation models for multiple texts with conflicting information, is reminiscent of the well-known constructs of selective exposure (Festinger, 1957) and confirmation bias (Nickerson, 1998). However, the Two-Step Model differs from the latter constructs and the associated theories in that plausibility or text-belief consistency effects are assumed to take effect already during comprehension – to be more precise, as a by-product of regular comprehension processes. This proposal stands in sharp contrast to the classical view, which is also adopted by most work on confirmation biases, that the plausibility of information is evaluated in a separate step of information processing that occurs *after* comprehension has been completed (e.g., Connell & Keane, 2006; Gilbert, 1991).

Step 2: Elaborative Processing of Conflicting Information

Shallower processing of belief-inconsistent information seems to be the default way to process this type of information. Nevertheless, there can be no doubt that readers sometimes devote even more cognitive resources to belief-inconsistent information to actively resolve the inconsistency. There are cases when readers who encounter a belief-inconsistent claim do not reject or ignore this claim but search their long-term memory or additional sources for alternative reasons that support or refute the implausible information. Such *elaboration of information* is likely to improve the comprehension of conflicting information, especially belief-inconsistent information (for a review of available studies, see Richter & Maier, 2017).

The Two-Step Model further assumes that, unlike the routine validation processes in the first step, the elaboration of belief-inconsistent information is under the strategic

control of the reader. Importantly, this assumption implies that strategic elaboration of inconsistent information occurs only in a specific motivational state characterized by students' assumption of an epistemic reading goal (Richter, 2003). Epistemic reading goals are those that include the acquisition of knowledge in a classical (philosophical) sense, that is, the acquisition of true and justified beliefs (e.g., Ichikawa & Steup, 2018). Such reading goals can be contrasted with, among others, receptive reading goals that involve memorizing information regardless of its truth value or justification (imagine, for example, a student memorizing information for a multiple-choice test). Epistemic reading goals can take many forms, such as reading a text out of epistemic curiosity (Richter & Schmid, 2010, Study 2), reading a text to scrutinize the position of an opponent (Edwards & Smith, 1996), or reading a text to gather information to make an important decision (e.g., about medical treatment). Adopting such a goal benefits the comprehension of multiple texts. For example, in a study by Wiley and Voss (1999) participants wrote more coherent essays with stronger causal links and scored better in comprehension tasks when they were instructed to write an argumentative essay (which is likely to induce an epistemic reading goal) as compared to being instructed to write a summary or a narrative text (which is likely to induce a receptive reading goal).

At the metacognitive level, epistemological beliefs may be relevant for whether readers adopt epistemic reading goals at all. For example, readers need to be aware that knowledge can change in light of new evidence. They also need to endorse the belief that although people can make different knowledge claims, knowledge is not arbitrary but needs to be justified in an appropriate way. Thus, a mature epistemological position such as commitment within relativism (Perry, 1970) or reflective judgment (King & Strohm Kitchener, 1994) is an important precondition for the elaborative processing of belief-inconsistent information.

Besides being motivated to do so, readers must also be able to engage in the strategic elaboration of belief-inconsistent information. Elaborative processing is costly in terms of cognitive resources and requires prior knowledge. Therefore, the Two-Step Model of Validation assumes that time pressure, low working memory capacity, or low prior knowledge make it unlikely that readers strategically elaborate on belief-inconsistent information (Richter & Maier, 2017).

EDUCATIONAL IMPLICATIONS OF THE TWO-STEP-MODEL: FOSTERING THE INTEGRATION OF CONFLICTING INFORMATION IN MULTIPLE TEXT COMPREHENSION

Using validation and the implicit plausibility judgments to regulate comprehension is to some extent beneficial for the comprehension of multiple texts as readers are able to preserve cognitive resources. Validation reflects a basic form of epistemic vigilance, i.e., the ability not to trust information blindly (Sperber et al., 2010). As such, it can protect the mental system from inaccurate information (although this protection is far from perfect). Moreover, it allows readers to construct and maintain coherent and consistent mental representations even if they are confronted with conflicting or even contradictory information (Isberner & Richter, 2014a). However, the crux of the matter is that validation can also be based on false and subjective beliefs, in which case it contributes to the persistence of such beliefs. On a more general level, whenever there is a rational dispute with arguments presented for different viewpoints (e.g.,

in scientific controversies, Britt, Richter, & Rouet, 2014), it is desirable that readers consider, comprehend, and scrutinize arguments that run against their beliefs to the same extent as arguments that are in line with their beliefs. In this sense, the ability to construct a balanced mental representation of conflicting information – or to integrate belief-inconsistent information in multiple text comprehension – is an important aspect of open-mindedness and cognitive flexibility (Richter, 2011). Fostering this ability may be considered as an important goal of education.

The Two-Step Model of Validation has clear implications for how this educational goal may be reached. Given that validation is a routine, non-strategic component of comprehension that further supports comprehension in important ways, it seems neither possible nor advisable to design interventions that suppress validation during reading multiple texts. In other words, for someone holding strong beliefs on a controversy, it does not make sense to try to adopt a neutral stance during reading multiple texts on that issue. In contrast, interventions that promote engagement in strategic elaboration of conflicting information, that is, engagement in Step 2 according to the Two-Step Model of Validation, seem promising. In line with this idea, a growing body of research indicates that the readers' skills related to strategic validation in multiple texts can be improved through suitable instruction and training interventions, as discussed next.

A number of studies have focused on sourcing, that is, being aware of source characteristics and using them for evaluating information, as a means of increasing the comprehension of multiple perspectives (e.g., Macedo-Rouet, Braasch, Britt, & Rouet, 2013; Stadtler & Bromme, 2008). Source characteristics of texts providing conflicting information can be useful to assess the general trustworthiness or credibility of these texts. For example, a text on nitrogen oxides is more trustworthy when written by an independent scientist than by an employee of a car manufacturer. Teaching sourcing strategies aims at improving the readers' evaluation of the credibility and usefulness of a document's source (Macedo-Rouet et al., 2013) and enhancing source awareness (Strømsø, Bråten, & Britt, 2010). Paul, Cerdán, Rouet, and Stadtler (2018) reported that, although children in elementary school were able recognize source information, they failed to use this information when they were asked to judge short controversial texts on health-related issues. Similarly, Paul, Stadtler, and Bromme (2017) could show that children in elementary school who received a sourcing prompt reported more source characteristics when judging controversial texts. However, there were no differences in the judgements of the texts between children who received the sourcing prompt and those who did not. Hence, the mere instruction to consider source information when processing conflicting information may not be sufficient to improve readers' sourcing skills (see Stadtler, Scharrer, Macedo-Rouet, Rouet, & Bromme, 2016, for a discussion). A more promising approach was examined by Stadtler and Bromme (2008) who improved laypersons' knowledge about sources and the use of source information with a computer-based tool that repeatedly prompted students to evaluate the source of incoming information. Wiley and colleagues (2009) successfully taught undergraduate university students to evaluate the reliability of information sources in order to enhance students' skills in searching for reliable information. Britt and Aglinskas (2002) developed a computer-based tutoring and practice environment to teach high-school students the strategies of sourcing and corroborating. Multiple documents with varying source characteristics (e.g., document type, document date)

about the same historical controversies were presented to high school students, either by a lecturer, via textbook or embedded in the computer-based tutorial. Results showed that students who received the training more often attended to source information in an intertextual essay-writing task and answered more sourcing-related questions correctly as compared to the other conditions. In sum, empirical research has shown that sourcing skills can be improved by training interventions. However, what we do not know at this point is whether and to what extent sourcing interventions also improve integration of belief-inconsistent information and can help readers to achieve a more balanced mental representation. According to Braasch, McCabe, and Daniel (2016), there seems to be a trade-off between memory for sources and content integration. In three experiments, these authors varied the semantic congruence of multiple texts and found that integration was better but memory for sources was poorer for semantically more congruent texts.

Another way to foster strategic elaboration of conflicting information is to improve readers' abilities to decode the internal structure of arguments and to discriminate weak from strong arguments. Multiple texts contain arguments of varying quality. Thus, the comprehension and proper evaluation of arguments is a key competence for making sense of multiple texts with conflicting information. Despite the importance of these skills, high-school students and university students at the beginning of their studies have difficulties in the proper evaluation of arguments, in particular their internal consistency and plausibility (e.g., Larson, Britt, & Kurby, 2009; von der Mühlen et al., 2016b). Training interventions have focused on conveying knowledge about the functional structure of informal arguments (often on the basis of the argumentation model of Toulmin, 1958) and on practicing the skills to identify functional argument components (such as claim, reason, warrant, and rebuttal). Another approach is to provide information about argumentation fallacies combined with practice in identifying fallacies. For example, Larson et al. (2009) taught undergraduate university students about typical argumentation flaws and how to recognize the claim in informal arguments. Results of three studies showed that university and high school students in the training conditions outperformed those students that were not given the treatment.

Von der Mühlen, Richter, Schmid, and Berthold (2018) found similar results in an experimental study that evaluated the effectiveness of training university students to grasp the functional structure of informal arguments. The students' ability to recognize and allocate argument components was measured before and immediately after the training intervention in a four-week follow-up. Moreover, argument complexity was varied in order to distinguish between arguments with typical or less typical structure. Results showed that students who completed the training intervention performed better after the training compared to students in an active control condition (speed reading exercise) especially for the more complex arguments and when the students had demonstrated higher abilities prior to the training.

A study by Dwyer, Hogan, and Stewart (2012) used an argument mapping training intervention in which participants were taught to visualize functional components of text-based arguments and their inferential relationships. University students who worked with this technique showed higher skills in critical thinking and evaluating the quality of arguments as compared to students in a passive control condition. In sum, several experimental training studies show that a training about the structure of informal arguments and argumentation fallacies combined with practice tasks can enhance

students' abilities to evaluate the structure of informal arguments and to judge their plausibility. Nevertheless, like for the sourcing training, evidence that a training in argument comprehension and evaluation can improve the comprehension of belief-inconsistent information in multiple text comprehension is still needed.

Finally, the Two-Step Model of Validation implies that improving readers' meta-cognitive knowledge about and strategies for the processing of conflicting information should be effective in achieving a better integration of belief-inconsistent information and overcoming text-belief consistency effects and plausibility biases. One simple approach is to create an awareness of potential biases resulting from routine valida-tion processes, along with strategies that can be used to control the outcomes of these processes. Maier and Richter (2014) provided a short training of three metacognitive strategies, becoming aware of the effects of routine validation, actively using of prior knowledge to evaluate arguments, and scrutinizing intertextual argumentative rela-tionships. When this training was combined with favorable motivational conditions (created with positive performance feedback), the text-belief consistency effect was eliminated.

CONCLUSION

In formal and informal learning, it is common for readers to deal with multiple per-spectives, in our case, multiple texts that present conflicting information on controver-sial topics. The Two-Step Model of Validation uses the assumption that validation is a routine part of comprehension as the basis for explaining why readers often have dif-ficulties comprehending information that is not in line with their beliefs. Specifically, it is suggested that readers often rely on a simple plausibility heuristic that leads to the preferential processing and comprehension of belief-consistent information and as a consequence to the text-belief consistency effect in the mental representation of multi-ple texts. Moreover, an epistemic reading goal as well as sufficient cognitive resources are postulated by the Two-Step Model of Validation as motivational and cognitive prerequisites for readers to resolve consciously noted inconsistencies through elabo-rative processing.

The Two-Step Model of Validation can be used to explain robust findings in mul-tiple text comprehension such as the text-belief consistency effect and the plausibility effect. In addition, paying attention to the role of validation in multiple text compre-hension also allows deriving interesting and promising approaches for trainings and interventions in the field. Nevertheless, the role of validation for multiple perspectives based on different types of representations, such as visualizations or auditory infor-mation, needs to be clarified in future research. Similarly, the relationship between validation and the other two component processes of comprehension – activation and integration – needs to be further narrowed and refined. Both avenues of future research will increase our knowledge about the role validation plays for readers' inte-gration of multiple streams of information.

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