The Role of Source Credibility in the Validation of Text Information

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Vorgelegt von

Andreas Gabriel Wertgen

aus Kassel

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Betreuer: Prof. Dr. Tobias Richter

Erstgutachter: PD Dr. Peter Marx

Zweitgutachterin: Prof. Dr. Gerhild Nieding

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Summary

Numerous experiments have shown that an evaluative and passive process, known as validation, accompanies activation and integration, which are fundamental processes of text comprehension. During the construction of a mental model, validation implicitly assesses the plausibility of incoming information by checking its consistency with world knowledge, prior beliefs, and contextual information (e.g., the broader discourse context). However, research on potential influences that shape validation processes has just started. One branch of research is investigating how world knowledge and contextual information contribute to integration and validation. World knowledge usually influences validation more strongly because information plausibility is the primary criterion for validation, but strong contextual information can yield influences as well.

Contextual information that may be specifically relevant for routine validation is the credibility of a source providing text information. Source credibility bears a strong conceptual relationship to the validity of information. However, a dearth of research has investigated joint effects of plausibility and source credibility for routine validation. To fill this research gap, the aim of the present dissertation was to examine the role of source credibility in routine validation processes of text information. This dissertation argues that both source credibility and plausibility are considered in these processes. In particular, information plausibility is proposed as the primary criterion, but source credibility may modulate validation as an additional criterion. To this end, three studies with five self-paced reading experiments were conducted in which reading times served as an implicit indicator of validation and plausibility judgments as an explicit indicator, and the convergence or divergence between the two indicators was interpreted.

The first study examined the interplay of plausibility and source credibility for the validation of world-knowledge consistent versus inconsistent text information embedded in

short narratives. This highly plausible or highly implausible information was provided by a high- or low-expertise source. In Study 1, plausibility dominated validation as suggested by faster reading times and higher plausibility judgments for world-knowledge consistent information. Importantly, source credibility modulated the validation of highly implausible information but seemed to not matter for plausible information. High-credible sources increased the implausibility of highly implausible information to a greater extent compared with low-credible sources as indicated by longer reading times and lower plausibility judgments. These results diverged from recent findings from Foy et al. (2017).

The second study investigated whether the modulating role of source credibility depends on the degree of implausibility of an information. Thus, Study 2 extended Study 1 by an intermediate, somewhat implausible level of plausibility (comparable to the implausible claims in Foy et al., 2017). Similar to Study 1, plausibility dominated validation as indicated by lower reading times and plausibility judgments with higher world-knowledge inconsistency. Again, source credibility had no effect on the routine validation of plausible information. However, high-credible sources mitigated the implausibility of somewhat implausible information as indicated by faster reading times and higher plausibility judgments but exacerbated the implausibility of highly implausible information as indicated by slower reading times and lower plausibility judgments.

In short, Study 2 findings not only integrates the seemingly divergent results of Study 1 and Foy et al. (2017) but also provides strong support for the assumption that the degree of implausibility determines the modulating role of source credibility for validation.

The third study examined the relationship of source credibility and plausibility in an ecologically valid social media setting with short Twitter messages varying in world-knowledge and text-belief consistency by trustworthy and untrustworthy sources. In sum, plausibility and to a lesser extent source credibility mattered for routine validation and explicit evaluation of text information as indicated by reading times and plausibility

judgments. However, the pattern partly diverged from Study 1 and 2, possibly because the source information was more salient.

In sum, the present dissertation yielded three insights. First, the findings further extends evidence for routine validation based on world-knowledge and prior beliefs. Second, the studies suggest that source credibility can modulate validation. Readers used source credibility cues for routine validation and the explicit evaluation of text information in all studies. Third, the impact of source credibility seems to depend on the degree of implausibility of information.

The present findings have theoretical implications for theories of validation and text comprehension as well as practical implications for targeting threats associated with the prevalence of inaccurate information, for example, on the World Wide Web. Future research using eye-tracking methodology could further disentangle the routine and strategic underlying processes of the relationship between source credibility and plausibility.

Zusammenfassung

Zahlreiche empirische Untersuchungen konnten zeigen, dass ein passiver und evaluativer Prozess – genannt Validierung – die Aktivierung und Integration von Textinformationen mit leserseitigem Vorwissen und Überzeugungen als grundlegende Prozesse des Textverstehens begleitet. Während der Konstruktion des Situationsmodells erfassen Validierungsprozesse fortlaufend und implizit die Plausibilität einer eingehenden Information, indem sie die Konsistenz mit leserseitigem Vorwissen und Überzeugungen sowie mit Kontextinformationen (z. B. vorherige Textinformationen) überprüfen. Die Erforschung weiterer Einflussgrößen für die Validierung hat jedoch gerade erst begonnen. Ein Forschungszweig beschäftigt sich mit der Frage, wie sich Kontextinformationen und Vorwissen in ihrem Beitrag zu Integrations- und Validierungsprozessen unterscheiden. Ein Befund dabei ist, dass das Vorwissen häufig einen stärkeren Einfluss auf die Validierungsprozesse hat und folglich die Informationsplausibilität das primäre Kriterium für die Validierung von Textinformationen ist. Starke Kontextinformationen können jedoch ebenfalls für die Bewertung von eingehenden Informationen herangezogen werden.

Eine spezifische Kontextinformation, die eine konzeptuelle Verbindung zu der Validität einer Information hat und daher eine besondere Relevanz für die Validierung von Textinformationen besitzt, ist die Glaubwürdigkeit der Quelle, die eine Textinformation liefert. Es gibt jedoch nur vereinzelte Studien, die das interaktive Zusammenspiel der Informationsplausibilität und Quellenglaubwürdigkeit für die Validierung von Textinformationen untersucht haben. Die vorliegende Dissertation setzt an dieser Lücke an und untersucht die Rolle der Quellenglaubwürdigkeit für die routinierte Validierung von Textinformationen. Dabei wird angenommen, dass sowohl die Plausibilität als auch die Quellenglaubwürdigkeit in diesen Prozessen berücksichtigt werden. Die Plausibilität einer Information sollte hierbei das primäre Kriterium sein, das zur Validierung herangezogen wird,

aber die Quellenglaubwürdigkeit sollte als zusätzliches Kriterium genutzt werden und die Prozesse potentiell zu modulieren. Zur Überprüfung dieser Annahmen wurden drei Lesezeitstudien mit insgesamt fünf Experimenten durchgeführt.

Ob implizite und explizite Maße konvergieren oder divergieren ist aufschlussreich für die Untersuchung der Prozesse des Textverstehens. Daher dienten die Lesezeit als implizites Maß für Validierungsprozesse und die Beurteilung der Plausibilität einer Textinformation als explizites Maß in allen Studien.

Die erste Studie untersuchte die Beziehung von Plausibilität und Quellenglaubwürdigkeit bei der Validierung von Textinformationen, die konsistent (plausibel) oder inkonsistent (stark unplausibel) mit dem Vorwissen waren. Diese Textinformationen waren eingebettet in kurzen Geschichten und wurden von einer Quelle mit viel bzw. wenig Expertise hinsichtlich des angesprochenen Wissensbereichs geäußert.

In Studie 1 führten plausible Textinformationen zu kürzeren Lesezeiten und höheren Plausibilitätsurteilen als stark unplausible Textinformationen. Für plausible Informationen schien die Quellenglaubwürdigkeit keine Rolle zu spielen, jedoch führten glaubwürdige Quellen zu höheren Lesezeiten und niedrigeren Plausibilitätsurteilen bei stark unplausiblen Informationen. Studie 1 legt nahe, dass die Konsistenz mit dem Vorwissen das Hauptkriterium für die Validierung war und die Quellenglaubwürdigkeit als zusätzliches Kriterium die Validierung unplausibler Informationen modulieren kann, jedoch in der Wirkrichtung scheinbar abweichend zu aktuellen Befunden ist (Foy et al., 2017).

Die zweite Studie untersuchte, ob die in Studie 1 gefundene, modulierende Rolle der Quellenglaubwürdigkeit für Validierungsprozesse vom Grad der Unplausibilität einer Information abhängt. Hierzu wurden die Konzeption und die Materialien der ersten Studie um eine mittlere Plausibilitätsstufe, die als „etwas unplausibel" bezeichnet werden kann, erweitert; sonst waren die Studien sehr ähnlich.

In Studie 2 zeigte sich ein dreigestufter Plausibilitätseffekt abhängig von der Konsistenz mit dem Vorwissen. Plausible Textinformationen wurden schneller gelesen und als plausibler beurteilt als etwas unplausible Informationen. Diese wiederum wurden schneller gelesen und als plausibler eingeschätzt als stark unplausible Informationen. Erneut wurde die Quellenglaubwürdigkeit während des Lesens plausibler Informationen nicht berücksichtigt, modulierte aber die Validierung unplausibler Informationen. Glaubwürdige Quellen verglichen mit unglaubwürdigen Quellen führten zu kürzeren Lesezeiten und einer höher eingeschätzten Plausibilität für etwas unplausible Informationen, aber verlängerten die Lesezeiten und verringerten die Plausibilitätsurteile stark unplausibler Informationen – letzteres war identisch mit dem Ergebnis von Studie 1.

Studie 2 zeigt, dass die Plausibilität einer Information das Hauptkriterium für wissensbasierte Validierungsprozesse war. Wenn Informationen einen gewissen Grad an Unplausibilität erreichen, können glaubwürdige Quellen die Plausibilität eigentlich unplausibler Informationen erhöhen oder sogar weiter verringern. Die Ergebnisse von Studie 2 belegen die Annahme, dass der Grad der Unplausibilität einer Information die modulierende Rolle der Glaubwürdigkeit einer Quelle bestimmt und darüber hinaus werden die Befunde von Studie 1 und Foy et al. (2017) integriert.

Die dritte Studie untersuchte die Beziehung von Plausibilität und Quellenglaubwürdigkeit eingebettet in einem sozialen Medium mit kurzen Twitter-Nachrichten als ein ökologisch valider Kontext. Die Nachrichten unterschieden sich in der vom Text vermittelten Überzeugung und der Vorwissenskonsistenz. Diese Nachrichten wurden präsentiert von stark und wenig vertrauenswürdigen Quellen. Zusammenfassend zeigen Lesezeiten und Plausibilitätsurteile, dass die Informationsplausibilität und in einem geringeren Maße die Quellenglaubwürdigkeit für die routinierte Validierung und explizite Bewertung der Textinformationen von Bedeutung waren, aber mit einem teilweise

abweichenden Muster zu Studie 1 und 2. Eine mögliche Erklärung könnte in den stark salienten Quelleninformationen in Studie 3 liegen.

Zusammengefasst hat die vorliegende Dissertation drei Erkenntnisse erbracht. Erstens, die Befundlage für routinierte Validierungsprozesse basierend auf der Plausibilität einer Information wurde erweitert. Zweitens, die Studien legen nahe, dass die Glaubwürdigkeit einer Quelle dabei auch eine Rolle spielt: in allen Studien nutzten die Leserinnen und Leser die Quellenglaubwürdigkeit als zusätzlichen Hinweis zur Validierung und zur expliziten Plausibilitätsbewertung von Textinformationen. Drittens, die Stärke und die Richtung des Einflusses der Quellenglaubwürdigkeit für die wissensbasierte Validierung von Textinformationen scheint vom Grad der Unplausibilität einer Information abzuhängen.

Diese Ergebnisse erlauben Schlussfolgerungen für Theorien der Validierung und des Textverstehens sowie praktische Implikationen für die Bekämpfung von möglichen Folgen, die mit der Verbreitung von Falschinformationen verbunden sind. Zukünftige Experimente basierend auf Blickbewegungen könnten helfen die routinierten und strategischen Prozesse genauer zu trennen, die die Beziehung von Quellenglaubwürdigkeit und Plausibilität für die Validierung bestimmen.

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1   Introduction

Processing and comprehending information in a discourse or text is an important competence in everyday life and is generally a widespread activity to encounter (new) information. That includes, for example, grasping a newspaper article about a socio-scientific topic such as climate change, capturing the gist of a short story about friends going on vacation, or understanding a Twitter message about vaccination. In all these examples, readers need to build a coherent and accurate mental representation of the situation described within the text during reading to achieve meaning. This cognitive representation is called a mental model or situation model (Johnson-Laird, 1983; Kintsch, 1988; van Dijk & Kintsch, 1983; Zwaan & Radvansky, 1998). The continual construction of a situation model includes the passive activation and integration of prior text information, world knowledge, and beliefs in response to the incoming information (e.g., Myers & O'Brien, 1998). For example, reading a text about climate change might lead to activation and integration of related knowledge such as the greenhouse effect.

However, text information often conflicts with world knowledge and is inconsistent with the reader's beliefs or prior text information (e.g., Albrecht & O'Brien, 1993; Maier et al., 2018; Rapp, 2008). For example, the newspaper article may contradict other previously read articles about climate change, the protagonist in the short story may falsely assert that the Atlantic Ocean is the largest ocean, or the Twitter message may state that vaccinations cause autism. Simultaneously, situation models need to be protected from such inaccuracies and inconsistencies to achieve meaning, that is, to hold up against the criteria of coherence and accuracy.

How can situation models be protected from such inaccurate or inconsistent text information during reading? The answer possibly lies in validation, a passive and routine

process that complements activation and integration as a third fundamental process of text comprehension.

Validation has been introduced as the evaluation of incoming text information based on the consistency with prior text information, world knowledge, and prior beliefs during text comprehension (O'Brien & Cook, 2016a, 2016b; Richter, 2015; Singer, 2013, 2019). Hence, validation processes hinder inaccuracies and inconsistencies from entering the situation model by implicitly judging the plausibility of the information and rejecting information that results in insufficient plausibility. Accordingly, the resulting plausibility can be defined as the fit between the incoming text information and the epistemic background (e.g., Connell & Keane, 2006), that is, world knowledge, prior beliefs, or prior text information.

Research based on two theoretical frameworks of validation—the Resonance-Integration-Validation Model (RI-Val; O'Brien & Cook, 2016a, 2016b) and the Two-Step Model of Validation (Richter, 2015; Richter et al., 2009; Richter & Maier, 2017)—yielded a large body of evidence in support of routine validation as an integral part of text comprehension that results in implicit plausibility judgments of incoming text information (e.g., Abendroth & Richter, 2021; Ferretti et al., 2008; Maier & Richter, 2013a; Schroeder et al., 2008; Singer, 2006).

Although a wide range of experimental approaches have provided evidence for routine validation that draws on contextual information (e.g., prior text information or the discourse context), world knowledge, and prior beliefs, research on conditions and factors that additionally shape validation has just started (e.g., Gilead et al., 2019; Piest et al., 2018; Singer & Doering, 2014). Within this research on conditions and factors, one branch is systematically mapping out how contextual information and world knowledge may differ in their contributions to validation (e.g., Isberner & Richter, 2014a; van Moort et al., 2018, 2020, 2021; Walsh et al., 2018; Williams et al., 2018).

One specific type of contextual information is the credibility of its source. In addition to the validation of text information when reading, the validation of its source may also play a role, especially when the information is inaccurate or inconsistent (Bråten & Braasch, 2018). Following the three prior examples above, source information could be the trustworthiness of the newspaper, the geographical expertise of the protagonist, or the organization behind the Twitter account.

Previous research has shown that the strategic evaluation of such source information and its credibility is a relevant aspect of validation processes that foster text comprehension in general and the understanding of multiple contradictory texts specifically (for an overview, see Bråten et al., 2018). Moreover, recent research suggests that readers are sensitive to source credibility during reading and as a result might attend to source information as a strategic repair process that occurs after validation processes have detected an inaccuracy or inconsistency (e.g., Braasch & Bråten, 2017; Braasch & Kessler, 2021; Braasch et al., 2012).

However, less is known about the inverse relationship, that is, the extent that source credibility influences routine validation during reading. The validity of information may be evaluated based on its plausibility but also based on the credibility of the source conveying the information. In particular, readers might use the source credibility as a cue that signals whether the information provided by the source is believable. However, the extent that readers use source credibility cues during validation is an open question because only little evidence has been reported for joint effects of plausibility and source credibility in routine validation (Braasch et al., 2012; Foy et al., 2017; Sparks & Rapp, 2011).

Investigating how source credibility affects routine validation processes is relevant from a theoretical and a practical perspective. Theoretically, this inquiry adds to the understanding of validation in general, and it specifically adds to the debate about how contextual information and world knowledge contribute to the fundamental processes during reading as foremost highlighted in the RI-Val model (O'Brien & Cook, 2016a, 2016b).

Practically, the steadily growing prevalence of inaccurate and inconsistent information is a challenge for modern society (e.g., Scheufele & Krause, 2019). In this context, inaccuracies regarding world knowledge are often labeled as misinformation (e.g., Rapp & Braasch, 2014). Moreover, text information published on the World Wide Web often has little to no editorial gatekeeping compared with traditional printed media, which facilitates the spread of misinformation. One threat associated with the prevalence of misinformation is that it affects recipients' processing under certain conditions and tampers with long-term memory of accurate information (e.g., Ayers & Reders, 1998). For example, multiple experiments suggest that readers store and later use inaccurate information embedded in fictional narratives, even though they principally know that the information is inaccurate (e.g., Marsh & Fazio, 2006; Rapp, 2008; Rapp et al., 2014). An opportunity for readers to brace themselves against misinformation might lie in the use of source credibility as a relevant cue, apart from assessing the information plausibility.

The overall aim of this dissertation was to explore the role of source credibility for routine validation of text information. This aim comprises three interrelated goals that motivated the empirical studies. The first goal was to investigate joint effects of source credibility and plausibility in validation of text information. The second goal was to examine this relationship in detail, focusing on the extent that source credibility depends on information plausibility in routine validation. The third goal was to examine this relationship in a more ecologically valid setting. To this end, three empirical studies with text material similar to the initial examples were conducted, which were either published in or submitted to international peer-reviewed journals (Chapter 4 to 6).

To my knowledge, Foy et al. (2017) was the only study that directly examined the interplay of plausibility and source credibility for routine validation. Hence, the first study was conceptually close to Foy et al. (2017) and aimed to investigate the extent that source

credibility is considered as a cue for the validation of text information that varies in its consistency with world knowledge embedded in narratives.

The second study was conducted to elucidate the relationship of plausibility and source credibility in more detail based on the design and findings of Study 1. To this end, Study 2 focused on the degree of information (im)plausibility as a key to the theoretical understanding of how source credibility is used in knowledge-based validation. A second goal of Study 2 was to integrate the seemingly divergent findings of Foy et al. (2017) and Study 1 based on the varying degrees of implausibility of text information between the studies.

In online reading situations, such as in social media interactions, the evaluation of message plausibility is a particularly important issue (e.g., Metzger et al., 2010). The third study examined the possible interplay of plausibility and source credibility in a social media context as an ecologically valid setting by using short Twitter messages and commonplace source information such as media outlets, companies, and other organizations.

In the present dissertation, I will introduce an overview of the theoretical and empirical background for theories of validation and the groundwork for the role of source information and its evaluation in text comprehension. Subsequently, the preliminary research on the possible interplay of source credibility and plausibility on the evaluation of text information is outlined (Chapter 2). In Chapter 3, the general rationale of the three studies and their relations are presented in accordance with the research questions. In Chapter 4, Chapter 5, and Chapter 6, the empirical studies, conducted to answer the research questions and goals, are displayed in more detail. Chapter 7 summarizes the findings and discusses the theoretical and practical implications of the present research. Finally, the limitations of the present studies are considered before a general conclusion is drawn.

2   Theoretical and Empirical Background

This chapter overviews the theoretical and empirical background for the three studies in this dissertation. The first section focuses on how processing of text information is commonly theorized to form a mental representation. Additionally, the section explains how such mental representations are built via activation and integration from a memory-based view. The second section introduces validation as an integral process of text comprehension that assesses the plausibility of text information and thus extends the theoretical understanding of activation and integration of information by a third and evaluative process. The third section briefly disscusess the role of source information and source credibility within text comprehension. Finally, the fourth section builds on the preceding sections and presents the limited research that has investigated combined effects of plausibility and source credibility in the validation of text information.

2.1   Memory-Based Theories of Text Comprehension

2.1.1   *Mental Representation of Text Information*

A wide spread view in the discourse literature is that text comprehension entails the construction of a mental representation with three levels of representation (Kintsch, 1988; van Dijk & Kintsch, 1983). In this view, the first level, called the surface level, includes all verbatim text information and the exact surface structure of a text. The second level, the propositional text base, entails semantic and rhetorical structures and the meaning of words and phrases. The text base includes all basic elements of text comprehension, that is, words, sentences, and propositions. The propositions of a text and their structure can be seen as the explicit semantic meaning that differs from the exact textual surface. Consequently, when a text is read, memory for the verbatim text vanishes quickly and a rough gist memory of the text evolves (Kintsch et al., 1990). The third level is labeled as a situation model (van Dijk & Kintsch, 1983) or a mental model (Johnson-Laird, 1983) and goes beyond the surface and text

base level. The situation model or mental model is a mental representation of the state of affairs described in a text. To this end, text information and parts of a reader's general world knowledge are integrated. In particular, the activated knowledge during a situation model functions as a basis for the enrichment and elaboration of the situation model and also to infer information from text that is not explicitly stated. Ideally, the construction of a situation model results in a coherent understanding of the described situation as intended by the author. Hence, text comprehension critically hinges on the appropriate construction and updating of the situation model (e.g., Albrecht & O'Brien, 1993; Richter & Singer, 2018).

Text comprehension theories and models have focused on numerous aspects of discourse comprehension (for an overview, see McNamara & Magliano, 2009). However, most theories and models focus on the question of how exactly the mental representation of a situation described in a text is built. A promising way to answer this question is to examine how activation and integration interact during comprehension and how (prior) text information and readers' general world knowledge contribute to these processes. Most theories or models differ between two theoretical approaches of how readers make use of text information and world knowledge. The first approach assumes that portions of prior text information and world knowledge become accessible through active processes by the reader (explanation-based processing; e.g., Graesser et al., 1994; Singer et al., 1994). The second approach assumes that access is mostly provided by passive processes (memory-based processing; e.g., Kintsch, 1988, 1998; Myers & O'Brien, 1998; Myers et al., 1994). The basic assumptions and principles of memory-based processing build the groundwork for theories of routine validation.

In the following sections, two complementary memory-based models of text comprehension will be outlined. In particular, I will describe the central assumptions of the Construction-Integration Model (CI model; Kintsch, 1988, 1998) and the Resonance Model by O'Brien, Myers, and colleagues (Albrecht & Myers, 1995; Albrecht & O'Brien, 1993;

Myers & O'Brien, 1998; Myers et al., 1994), which places more emphasis on (re)activation of distant information (i.e., inactive information). Finally, validation as a third fundamental process of text comprehension is briefly introduced.

2.1.2 Construction-Integration Model

The CI model (Kintsch, 1988, 1998) defines two separate processing stages of text comprehension—construction and integration. The first processing stage explicates how readers produce discourse representations from the text base and their general world knowledge. The text-based and knowledge-based constructions lead to an associative network of the concepts or propositions of a text. This network potentially includes concepts and propositions retrieved from the current input, the previous sentence or proposition, related general world knowledge, and prior text information. The construction stage has been defined as a "dumb" and retrieval-based activation process (i.e., purely associative). In line with these critical characteristics of construction, the associative network can incorporate elements that are related but irrelevant for the discourse representation.

The second stage refers to the spreading of activation through this constructed associative network until it stabilizes. Stabilizing is conceptualized within the CI model as the decrease in the spread of activation. Concepts that are more relevant, that is, have more connections to other concepts in the network, are activated more. In turn, less relevant nodes fade out (i.e., nodes with fewer connections to other concepts). The outcome of the integration phase is a network that only entails the most related and relevant nodes. Weaker nodes that are related but less relevant have vanished.

However, an important distinction between text comprehension models is the assumption how inactive information (e.g., distant prior text information) is accounted for in the construction and updating of a situation model (O'Brien & Cook, 2015). This assumption is related to the question of how global coherence is achieved even though not all information can be held active under the assumption of a limited working memory capacity. The

Resonance Model (Albrecht & Myers, 1995; Albrecht & O'Brien, 1993; Myers & O'Brien, 1998; Myers et al., 1994) proposes an explanation, which pronounces a memory-based view on reactivation of inactive information. Note that Kintsch (1998) highlights the construction phase of the CI model as mostly parallel to the concept of resonance as proposed by O'Brien, Myers, et al.

2.1.3   Resonance Model

The Resonance model (e.g., Myers & O'Brien, 1998) posits that when new information is encoded, a signal is sent to both active and inactive elements in memory. Information that consists of similar features will resonate in response to that signal— conceptually similar to the resonance response of one tuning fork to another. The more resonance a concept elicits the more likely it will be reactivated, which in turn can influence comprehension. Resonance processes are assumed to be automatic. As such, there is no need for readers to engage in strategic processing, for example, to actively search for information that could be activated. Furthermore, the resonance process is passive and unrestricted. Similar to the construction process, resonance is passive because after a certain degree of featural overlap is achieved, information or concepts are activated, irrespective of its influence on comprehension. Resonance is unrestricted because the episodic representation of text and general world knowledge can serve as a source for (re)activation.

Support for the assumptions of the Resonance model stems from the contradiction paradigm by O'Brien, Albrecht, and colleagues and the resulting inconsistency effect (e.g., Albrecht & O'Brien, 1993; Cook & Guéraud, 2005; Cook & O'Brien, 2014). In this paradigm, participants read texts that describe a protagonist's characteristic (e.g., junk food enthusiast vs. vegetarian). Later in the text, the protagonist behaves either consistently or inconsistently with this characteristic (e.g., ordering a cheeseburger). Usually, reading times of the critical sentence are longer for the inconsistent version compared with the consistent version. This processing advantage for consistent text information has been interpreted as

evidence that the textual contradiction is detected, leading to a (global) coherence break based on the information retrieved from memory of prior text via resonance.

However, (re)activated prior text information and world knowledge are not only used to enrich the situation model and to infer relations between prior and new text information but also to continually validate the incoming information and possible inferences about its plausibility (Singer, 2013). Moreover, the observed processing disruptions between consistent and inconsistent conditions in experiments based on the contradiction paradigm indicate not only integration difficulties but can be interpreted as instances of validation in which the outcome of integration is evaluated, leading to longer reading times for inconsistent information.

2.1.4   *The Third Fundamental Process of Text Comprehension: Validation*

The origin for validation as an evaluative process that verifies incoming text information based on the consistency with prior text information, general world knowledge, and prior beliefs arguably lies within Singer's validation theory of bridging inferences (Singer, 1993; Singer et al., 1992). In his work based on a series of reaction time experiments, Singer showed that inferences drawn during comprehension complete gaps between text information, but the inferences are also validated to establish a causal link between two events. Consider the following example from Singer et al. (1992):

Mary poured the water on the bonfire. The fire went out.

To adequately understand the two sentences, readers need to infer the missing premise, that is, water extinguishes fire. Singer et al. (1992) argued that this missing premise is validated against relevant general world knowledge. To test this assumption, participants answered matching questions such as "Does water extinguish fire?" after reading the example text above versus after reading a temporal control sentence pair (*Mary placed the water by the bonfire. The fire went out.*). Participants' response times to these questions were faster after causal sentences compared with the control sentences, suggesting that participants validated

the bridging inferences against general world knowledge. The notion of validation adds crucially to the understanding of situation model construction and updating and thus text comprehension in general (e.g., Richter, 2015; Richter & Singer, 2018; Schroeder et al., 2008).

2.2 Validation and Text Comprehension: The Implicit Assessment of Plausibility

In the discourse literature, a commonplace assumption is that readers construct a mental representation of the situation described in a text that integrates text information with activated knowledge (Johnson-Laird, 1983; van Dijk & Kintsch, 1983; Zwaan & Radvansky, 1998; see Chapter 2.1). When readers want to interact adequately with the world, they need this situation model to be coherent and accurate. However, information can be inconsistent with previous text information (e.g., Albrecht & O'Brien, 1993), with world knowledge (e.g., Rapp, 2008) or with the reader's beliefs (e.g., Abendroth & Richter, 2021; Maier et al., 2018). Such inconsistencies are obviously at odds with the aim to achieve a coherent and accurate situation model and consistently disrupt reading (e.g., Albrecht & O'Brien, 1993; Hakala & O'Brien, 1995; Rapp et al., 2001). Most traditional text comprehension models and theories rarely address explicitly how situation models are protected against inconsistent or inaccurate information. However, contemporary research has started to elaborate on how readers process such inaccuracies (e.g., Rapp & Braasch, 2014).

Numerous theoretical arguments and a steadily growing body of evidence strongly support the notion of an evaluative process that takes place during text comprehension (e.g., Isberner & Richter, 2013; Long & Lea, 2005; O'Brien & Cook, 2016a, 2016b; Richter et al., 2009; Schroeder et al., 2008; Singer, 2006; Wyer & Radvansky, 1999). This evaluative process has been labeled as (interchangeably) validation (O'Brien & Cook, 2016a, 2016b; Richter, 2015; Singer, 2013; 2019) or epistemic monitoring (Isberner & Richter, 2013; 2014a, 2014b; Richter, 2003, 2011; Richter et al., 2009; Schroeder et al., 2008). In short, validation

processes are an integral part of text comprehension by monitoring incoming text information

for its message consistency and validity (Singer, 2013). This monitoring process implicitly

judges the plausibility of incoming information by determining its fit with world knowledge,

prior beliefs, and prior text information.

In this context, plausibility can be defined as the "degree of fit between a given

scenario and prior knowledge" (Connell & Keane, 2006, p. 98) or as "acceptability or

likelihood of a situation or a sentence describing it" (Matsuki et al., 2011, p. 926). Readers are

assumed to use these implicit judgments of plausibility to select and weigh information during

comprehension, which results in plausibility-biased (Maier & Richter, 2013a, 2013b;

Schroeder et al., 2008) or belief-biased (Abendroth & Richter, 2021; Richter & Maier, 2017)

mental representations of text information or multiple texts.

In the remainder of this section, I will present in more detail two frameworks of

validation—the RI-Val model (O'Brien & Cook, 2016a, 2016b) and the Two-Step Model of

Validation (Isberner & Richter, 2014a; Richter et al., 2009; Richter & Maier, 2017; Schroeder

et al., 2008). After, I will outline conditions and factors that have been proposed to shape

validation processes. In this line of research, the debate of how world knowledge and

contextual information contribute to validation is emphasized, which is especially relevant for

the present research.

2.2.1   *The RI-Val Model of Comprehension*

The RI-Val model of comprehension by O'Brien and Cook (2016a, 2016b) originates

in the memory-based literature (Chapter 2.1). In line with the memory-based view, the RI-Val

model also assumes **R**esonance (activation) and **I**ntegration as fundamental processes of

comprehension. However, the model extends these processes by adding **Val**idation as a third

process. This process is defined as a passive pattern-matching process (similar to Kamas &

Reder, 1995) that evaluates the outcome of integration.

In the RI-Val model, incoming text information activates information through passive resonance-like processes (Myers & O'Brien, 1998; O'Brien & Myers, 1999; see Chapter 2.1.3). For resonance, the relevance and origin of the activated information is not important. Once activation has reached a certain level, that is, a minimum of two concepts, any (re)activated information is linked to information in active memory in the integration process. Integration is mainly based on conceptual overlap or the goodness of fit and yields a network with nodes based on the highly activated information. Nodes that are irrelevant or only weakly related vanish (similar to the CI model; Chapter 2.1.2). In the validation stage, the built linkages of integration are validated against all information activated from memory that potentially includes prior text information and world knowledge. Once the validation stage has reached the so-called coherence threshold (O'Brien & Cook, 2016a), readers can move on to subsequent text information.

The RI-Val model proposes three critical assumptions for activation, integration, and validation. First, the processes are assumed to be passive and unrestricted. Once started, the three processes stabilize over time, reach a peak but run to completion regardless of the comprehension status. The processes are unrestricted meaning they can assess prior text information stored in the form of an episodic representation and world knowledge retrieved from memory. Strong contextual information can influence processing and therefore comprehension (e.g., Colbert-Getz & Cook, 2013; Kendeou et al., 2013) as can general world knowledge (e.g., Walsh et al., 2018). However, world knowledge is often attributed more influence on text comprehension compared with contextual information (e.g., Sanford & Garrod, 1989). Research on how these two sources of information compete has provided growing support of the unrestricted idea of activation, integration, and validation (e.g., Creer et al., 2018, 2020; Cook & Myers, 2004; Rizella & O'Brien, 2002; Williams et al., 2018).

Second, all three processes are parallel and asynchronous, meaning they start sequentially but overlap. Therefore, new concepts may still be reactivated when integration is

initiated. Similarly, integration may produce new linkages when validation has started. Each

process is determined by the previous processing stage, but processes run in parallel. Thus,

highly related information is more prone to be part of activation and is likely to be considered

earlier in integration and validation, thus, having more potential to influence comprehension

compared with weaker related information (Cook & O'Brien, 2014). Research based on the

contradiction paradigm has repeatedly shown outdated or irrelevant information can continue

to influence comprehension (e.g., Cook et al., 1998; Cook et al., 2014; Guéraud et al., 2005;

Kendeou et al., 2013; O'Brien et al., 1998, 2004, 2010; Wei & Cook, 2016). These findings

suggest that the reactivated information can elicit influence despite its irrelevance in previous

processing. The asynchronous character of the processes implies that factors that increase

activation potentially mediate validation. In support of this assumption, Cook (2014) showed

that the underlying semantic relation between a cue (e.g., cello, violin, oboe) and a target

(e.g., cello) depends on the contextual support for that semantic relation. The processing times

of the target varied as a function of the semantic relations with decreasing processing times

from correct cues (cello) to incorrect and high-related cues (violin) to incorrect and low-

related cues (oboe).

The third critical assumption relates to the point at which validation arrives at

sufficient coherence for a reader to move on in the text, which is referred to as the coherence

threshold. The coherence threshold is assumed to depend on task, reader, and text variables

(O'Brien & Cook, 2016a; Sonia & O'Brien, 2021; Williams et al., 2018) and can be seen as a

subcomponent of readers' standards of coherence (van den Broek et al., 1995, 2011). As

stated in the first critical assumption, the fundamental processes run to completion, which

means that even though the reader has met the coherence threshold and started processing

subsequent text, validation can still be active. Hence, processing effects of validation may be

observable immediately (e.g., on a target sentence), immediately and after a delay, or only

after a delay (i.e., spillover effects). Hence, reaching the coherence threshold does not indicate

that processing has terminated. Note that this statement is particularly important for the present dissertation.

Cook and O'Brien (2014) provided evidence for the RI-Val model in general and support for the coherence threshold in a series of experiments that adapted the contradiction paradigm. The paradigm's original conception was based on a consistent (e.g., Mary is a junk food junkie) and an inconsistent condition (e.g., Mary is a vegetarian) with a later presented target sentence, leading to a slowdown in reading times for the inconsistent condition (Albrecht & O'Brien, 1993). In the extension, target sentences were either highly related (e.g., Mary decided to order a cheeseburger) to the relevant concept in world knowledge (e.g., meat) and the protagonist's characteristic (e.g., vegetarianism) or low related (e.g., Mary decided to order a tuna salad). Cook and O'Brien predicted that the inconsistency effect would be stronger for the high-related target sentences compared with the low-related target sentences, based on the connection between the concepts, that is, a cheeseburger is closer to the concept of meat than a tuna salad. Moreover, they predicted that reading target sentences would be immediately disrupted by the high-related inconsistency, but disruptive effects of the low-related inconsistency would only be prevalent on the spillover sentence because of its later availability based on the less conceptual overlap. Additionally, Cook and O'Brien tested whether these concepts would be active during comprehension through a verification probe task. In sum, the findings suggest that the strength of the inconsistency effect is a result of validation as a pattern-matching process. Moreover, less related information (e.g., tuna salad) can affect validation but its influence may not be observable immediately, not until the spillover sentence is processed and readers have already met their coherence threshold.

To conclude, the RI-Val model describes how fundamental comprehension processes act in concert by building on and extending memory-based text comprehension models. The model fruitfully explains and predicts activation, integration, and validation processes of text

comprehension. Importantly, the temporal assumptions of the RI-Val model can account for the so-called spillover effects, indicating a delayed influence of validation on processing.

2.2.2   *Two-Step Model of Validation: Epistemic Monitoring and Epistemic Elaboration*

The Two-Step Model of Validation entails two types of processes—epistemic monitoring and epistemic elaboration (Richter, 2015; Richter & Maier, 2017; Richter et al., 2009). The basic concept of epistemic monitoring is similar how validation is explained by the RI-Val view of validation (Chapter 2.2.1) and by Singer (2006, 2013, 2019). However, Richter and colleagues consider validation to be more than just solely passive, but instead they posit epistemic elaboration as an optional, strategic process of validation, which can occur subsequent to epistemic monitoring to further process inaccurate or inconsistent information. In the following section, I elaborate on epistemic monitoring because of its relevance for the present research.

Epistemic Monitoring. In short, epistemic monitoring is assumed to take place during the construction of the situation model and thus routinely accompanies comprehension. This monitoring process continually checks the consistency of incoming (linguistic) information with the current situation model, with general world knowledge, and with prior beliefs (Gilead et al., 2019; Isberner & Richter, 2013, 2014a, 2014b; Piest et al., 2018; Richter, 2011; Richter et al., 2009; Schroeder et al., 2008). Consequently, epistemic monitoring implicitly assesses the plausibility of incoming information by evaluating the consistency of the incoming information with the epistemic background.

Moreover, epistemic monitoring functions as an epistemic gatekeeper that routinely hinders inconsistent information from becoming part of a reader's situation model (Richter, 2015; Sperber et al., 2010). When incoming text information is consistent with the current situation model, accessible world knowledge, and the reader's beliefs, it passes the validation processes and is not validated further. Instead, it becomes part of the situation model and part of the epistemic background that validation draws on. Thus, epistemic monitoring helps to

maintain a coherent situation model and fosters the stability of situation models (Schroeder et al., 2008). In contrast, when incoming text information has been detected as inconsistent, it routinely is rejected and omitted from the situation model.

Similar to the RI-Val model, epistemic monitoring hinges on activation as a passive and unrestricted process that accesses information (e.g., world knowledge) via memory-based retrieval processes (similar to resonance, Chapter 2.1.3). Information that has been activated through resonance-like processes can readily be used to validate incoming information. In addition, the passive character implies its independence from readers' processing goals or an evaluative mindset. Hence, epistemic monitoring works relatively effortlessly and requires little cognitive resources, deeming the processes as involuntary and nonstrategic (Isberner & Richter, 2013, 2014a, 2014b; Richter et al., 2009). Note that a reader must have sufficient relevant world knowledge or beliefs activated in memory. Thus, an inconsistency might go undetected, if the inconsistent information is not co-activated, or if the reader has little relevant background knowledge or weak beliefs.

Strong evidence for involuntary and nonstrategic epistemic monitoring stems from the epistemic Stroop paradigm (Richter et al., 2009). The basic idea of this paradigm is if validation routinely assesses the plausibility of text information, then reading a sentence should already elicit an automatic response tendency depending on the sentence plausibility. This response tendency should interfere with an unrelated judgment task comparable to the Stroop effect (Stroop, 1935). Richter et al. (2009) asked participants to read three-word sentences word by word that were true or false at a fixed rate (e.g., 300 ms). At some point, participants were asked to judge the orthographical accuracy of the presented word, and in experimental trials, they judged the last word. The authors predicted that an incongruence of sentence plausibility and the required response in the judgment task should lead to longer reaction times and potentially more errors compared with congruent combinations. For example, reading *soft soap is edible* should elicit a negative response tendency based on its

world-knowledge inconsistency. This negative response tendency should interfere when the

last word is spelled correctly and requires a yes response, leading to higher reaction times and

more errors. In contrast, world-knowledge consistent sentences ("perfumes contain scents")

should reverse the pattern. Richter et al. (2009) found this interaction effect with longer

reaction times and partly higher error rates for incongruent compared to congruent conditions.

Numerous experiments add to the generalizability and robustness of the epistemic

Stroop effect. The expected interaction of sentence validity and required response was found

with sentences of varying plausibility (Abendroth et al., 2022; Isberner & Richter, 2013), with

belief-consistent and -inconsistent statements (Gilead et al., 2019), with audiovisual

information (Piest et al., 2018), and with identity threatening versus non-threatening

assertions (Abendroth et al., 2022). Tasks that also elicited epistemic Stroop effects are a

nonevaluative probe task, a color-judging task, and a grammatical task (Gilead et al., 2019;

Isberner & Richter, 2014a, 2014b; Piest et al., 2018; Wiswede et al., 2013).

In addition, an abundance of studies based on the contradiction paradigm support the

idea of routine validation with a slowdown in reading times for inconsistent compared to

consistent conditions on target or on spillover sentences (Albrecht & O'Brien, 1993; Cook &

O'Brien, 2014; Cook et al., 1998; Guéraud et al., 2005; Hakala & O'Brien, 1995; Kendeou et

al., 2013; Myers et al., 1994; O'Brien & Albrecht, 1992; O'Brien et al., 1998, 2004, 2010).

Other reading-time experiments revealed similar inconsistency effects based on general world

knowledge, yielding faster reading times for world-knowledge consistent compared to world-

knowledge inconsistent information (e.g., Rapp, 2008; van Moort et al., 2018). Similarly,

experiments employing text information that vary in the conveyed belief showed processing

disadvantages for text information inconsistent with participants' prior beliefs (e.g., Maier et

al., 2018; Wolfe et al., 2013). These inconsistency effects repeatedly suggest that the

processing disruption depends on the degree of implausibility as a result from the mismatch of

the validated information and the epistemic background—with a proportional disruptive increase of increasing implausibility (Cook & O'Brien, 2014).

The Two-Step Model of Validation argues for validation as an integral part of text comprehension. Hence, validation should be evident in early processing stages. However, reading-time and reaction-time experiments cannot fully account for the time course of validation processes. Experiments using event related potentials have shown support for the immediacy of validation processes and thus the close connection between validation and text comprehension (Ferretti et al., 2013; Haagort et al., 2004; Nieuwland, 2013; Wiswede et al., 2013). For example, Haagort et al. (2004) compared the processing of two types of text violations—semantic inconsistencies (e.g., Dutch trains are sour) and world knowledge inconsistencies (e.g., Dutch trains are white)—to an accurate version (e.g., Dutch trains are yellow). In contrast to accurate versions, they found no processing differences between these violations because both violations elicited similar enhanced N400 effects. This result suggests the immediacy for knowledge-based validation (see also Van Berkum et al., 2009). Likewise, experiments using eye-tracking indicated effects of plausibility on early processing of verb-noun pairs (Matsuki et al., 2011). Moreover, Staub et al. (2007) found that the plausibility of a head noun of noun-noun compounds (e.g., mountain lion) elicits automatic and rapid effects on eye movements, which also indicates the immediacy of validation.

Epistemic Elaboration. In the Two-Step Model of Validation, epistemic elaboration is an optional, subsequent processing stage in which readers strategically elaborate on inconsistent information as opposed to rejecting them (Richter, 2011; Richter & Maier, 2017). When readers have detected an inconsistency through epistemic monitoring, they can initiate an epistemic elaboration process—given enough motivation or a specific processing goal (e.g., an epistemic learning goal). That is, readers make active use of knowledge and elaborate on plausibility conditions of an assertion or an argument they initially found implausible. This

elaboration can achieve a balanced mental model, for example, of a controversial issue presented in multiple texts.

Evidence for epistemic elaboration stems from, for example, experiments based on an essay task within learning with multiple history texts (e.g., Wiley & Voss, 1999). In their experiments, Wiley and Voss instructed participants to write either an argumentative essay, a narrative text, or a summary of the text. Participants showed better performance on comprehension tasks when they were instructed to write an argumentative essay compared with other instructions, which supports the elaborative processing in epistemic elaboration.

The role of epistemic monitoring and epistemic elaboration has also been adapted for multiple text comprehension (Richter & Maier, 2017, 2018; Richter et al., 2020). In this context, epistemic monitoring based on readers' prior beliefs can result in a processing bias that leads to a partisan mental model of controversial issues displayed in multiple texts— called text-belief inconsistency effects. However, in their review, Richter and Maier (2017) also demonstrated how epistemic elaboration may help readers to engage actively in strategies to achieve a more balanced mental model of controversial issues in a second processing step, for example, by attending to and evaluating source information.

In conclusion, epistemic monitoring is a passive mechanism that involuntarily and routinely assesses the information plausibility by validating it against accessible world knowledge, prior beliefs, and the current situation model. Epistemic monitoring occurs early, that is, during situation model construction. Thus, epistemic monitoring is related strongly to and likely to be an integral part of text comprehension, protecting the situation model from contamination with inaccuracies and inconsistencies. Moreover, epistemic elaboration explains how readers can achieve balanced representations and why they often fail to achieve it based on epistemic monitoring (i.e., plausibility effects and text-belief consistency effects; Abendroth & Richter, 2021; Schroeder et al., 2008).

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2.2.3   *Additional Conditions and Factors that Influence Validation Processes: Contextual Information vs. World Knowledge*

Evidence for routine validation and its importance for text comprehension is extensive. However, attention to conditions and factors that influence validation is quite new. General influencing conditions for validation that have gained research interest include working memory capacity (de Bruïne et al., 2021; Singer & Doering, 2014; van Moort et al., 2018, 2021) and the standards of coherence and the related coherence threshold (Creer et al., 2018; Sonia & O'Brien, 2021; Williams et al., 2018). Additionally, specific conditions have gained interest, including text genre (Creer et al., 2018; Walsh et al., 2018), audiovisual stimuli (Piest et al., 2018), recency of information (Guéraud et al., 2018), validation of semantic anomalies (Cook et al., 2018; Williams et al., 2018), and developmental differences (Piest et al., 2018).

Most of the (specific) conditions, however, relate to the debate on how world knowledge vies with contextual information for integration and validation (e.g., Cook & Guéraud, 2005; Filik, 2008; Filik & Leuthold, 2008; Isberner & Richter, 2014a). In line with the unrestricted character of memory-based processing, any (retrieved) information can influence integration and validation as long as it shares sufficient conceptual overlap. One branch of research examines the unrestricted character within this competition more specifically (e.g., van Moort et al., 2018, 2020, 2021; Walsh et al., 2018; Williams et al., 2018). The general conclusion from this research is that integration and validation of contextual information and world knowledge differ in their contributions and time courses. For example, van Moort and colleagues tested how contextual information (text-based validation) and world knowledge (knowledge-based validation) contribute to integration and validation processes in three studies with reading times, neuroimaging, and eye tracking (van Moort et al., 2018, 2020, 2021). In their eye-tracking study, van Moort et al. (2021) provided evidence for distinct time courses of text-based and knowledge-based validation of text information with a more dominating role of knowledge-based validation. World-knowledge

inconsistencies consistently disrupted reading and these disruptions were more enduring compared to inconsistencies with contextual information. That is, a more dominating role of plausibility and less impact of contextual information.

Within this debate, one particular type of contextual information that may be especially relevant for validation processes is source credibility, which relates theoretically and empirically to the validity of text information. However, source credibility as an influencing condition has attracted only little research interest in the context of routine validation (Foy et al., 2017; Sparks & Rapp, 2011; see Chapter 2.4).

2.3   Evaluation of Source Information in Text Comprehension

The credibility of an information source can be construed as contextual information that shares a specific relationship to the validity of information apart from information plausibility (Chapter 2.2). Decades of research on sources have elicited numerous aspects of communicators that relate to their credibility. However, source credibility is usually conceptualized with two core dimensions: Expertise and trustworthiness (Lombardi et al., 2014; Pornpitakpan, 2004; Rouet et al., 2021; Self, 2009). Commonly, expertise is "the extent to which a speaker is received to be capable of making correct assertions" and trustworthiness "refers to the degree to which an audience perceives the assertions made by a communicator to be ones that the speaker considers valid" (Pornpitakpan, 2004, p. 244). Both dimensions are relevant for the present dissertation and both have spawned research across disciplines.

Most (early) research on the evaluation of source information and source credibility stems from social psychology research on persuasion and attitude change (Pornpitakpan, 2004; Rieh & Danielson, 2007; Self, 2009). However, models of sourcing within social psychology, such as the Heuristic-Systematic Model (Chaiken, 1987) and the Elaboration Likelihood Model (Petty & Cacioppo, 1986), do not explicitly focus on processes and strategies of comprehension. Instead, more research on how source information is relevant for (discourse) comprehension stems from studies on multiple text comprehension. In multiple

text comprehension, research on the processing and evaluation of source information has demonstrated how readers use source information to assess the credibility of texts and text information, albeit mostly through strategic processing. However, the present research aims at unravelling the role of source credibility in comprehending single texts and, importantly, as part of a nonstrategic monitoring process, that is, routine validation.

In the following sections, I present two related models that articulates the (strategic) processing and evaluation of source information as an important part of understanding how conflicting or discrepant (i.e., inconsistent) text information is processed: The Documents Model Framework (DMF; Britt & Rouet, 2012; Britt et al., 1999; Perfetti et al., 1999) and the Discrepancy-Induced Source Comprehension Model (e.g., Braasch et al., 2012).

2.3.1   *Documents Model Framework*

Research on the role of source information for text comprehension mostly originates from research on multiple text comprehension (Bråten et al., 2018). The DMF seeks to answer how readers comprehend multiple (conflicting) documents on the same topic and thus broadens the theoretical perspective of single text comprehension (Britt & Rouet, 2012; Britt et al., 1999; Perfetti et al., 1999). For example, students often approach a number of documents (e.g., texts) on the same topic to answer a problem or to understand a topic more deeply. In such a context, readers often encounter conflicting positions from multiple sources, especially when they approach controversial issues such as climate change or vaccination. Within the DMF, multiple text comprehension ideally consists of constructing a situations model of the read texts or documents, similar to single text comprehension (Chapter 2.1). However, an additional mental model—the intertext model—representing the argumentative relationship between the documents is warranted. Integration may be facilitated when the argumentative relationship of the documents is assessed (e.g., "Text A opposes Text B but is consistent with Text C"). Moreover, the construction of an intertext model might also be facilitated by providing attention to source information and cues to the source credibility of

the different documents. In particular, when different documents provide inconsistent or conflicting information about the same topic, an evaluation of the source information and the plausibility of the corresponding information as well as their relationships facilitates readers in achieving an adequate mental representation of multiple texts. Source information that may be included in this evaluation are the publication date, authors, and the document's layout.

A wide base of empirical research shows that readers strategically use source information to evaluate the credibility of texts (e.g., Anmarkrud et al., 2014; Bråten et al., 2009, 2011; Britt et al., 2013; Goldman et al., 2012; Strømsø et al., 2010; Wiley et al., 2009; Wineburg, 1991). For example, Wineburg (1991) found that sourcing is a strategy often used by experts to deal with multiple texts and the corresponding complexity. Further research has demonstrated that non-experts (i.e., students) are also aware of source information and use the perceived trustworthiness—as one dimension of source credibility—for the comprehension of multiple texts about climate change (e.g., Bråten et al., 2009; Strømsø et al., 2010).

To conclude, an evaluation of source information and its credibility is important to achieve an adequate mental representation of multiple texts with conflicting or inconsistent information on the same issue and to understand the relationship between sources and contents (Bråten et al., 2018).

2.3.2   *The Discrepancy Induced Source Comprehension Model*

Building on the DMF, Braasch and colleagues (Braasch & Bråten, 2017; Braasch & Kessler, 2021; Braasch et al., 2012) introduced the Discrepancy-Induced Source Comprehension Model (D-ISC model). A variety of experiments show the importance for readers to process source information and evaluate source aspects for better multiple texts comprehension (see Bråten et al., 2018, for an overview). However, less is known about when and how exactly source information is processed during reading of contradictory information by different sources. To this end, the D-ISC model proposes how source information is strategically attended to during moment-by-moment processing of discrepant information.

In short, the model assumes two processing types—consistent and discrepant processing. Consistent processing is assumed to continue without disrupting the reading process because readers experience cognitive equilibrium, which can be seen as conceptually related to coherence. However, processing of discrepant information is assumed to disrupt coherence and result in cognitive disequilibrium, with a discrepancy detected possibly by validation processes (see Chapter 2.2). The detection of a discrepancy or inconsistency then triggers readers to be more attentive to source information and its evaluation, possibly to resolve the cognitive disequilibrium. For example, a reader gathering information about the virus SARS-CoV-2 may encounter conflicting text information about the risks of an infection by two sources. One source (e.g., an epidemiologist) could be warning about the risks of an infection with the Coronavirus disease 2019 (COVID-19). Later in the text, a second source (e.g., a homeopath) could be advocating that COVID-19 is comparable to the risks of a common cold. In this case, the processing would be consistent, but only until the reader meets the discrepancy induced by the information provided by the second source. According to the D-ISC model, this discrepancy triggers discrepant processing and thus may prompt the reader to engage in evaluating the sources, which could result in a higher level of source credibility with COVID-19 for the epidemiologist compared with the homeopath.

In line with this notion, Braasch et al. (2012) found an increase in attention to sources for participants confronted with discrepant information in short news reports. More sources were reported, discrepant text versions were better remembered, and source information led to more fixations and gaze duration. More evidence in support of the D-ISC model and the role of source information and credibility for understanding discrepant text information stems from numerous studies (e.g., Bråten et al., 2016; de Pereyra et al., 2014; Gottschling et al., 2019; Kammerer et al., 2016; Saux et al., 2018, 2021; see Braasch & Kessler, 2021, for an overview).

2.4   Previous Research on the Roles of Plausibility and Source Credibility in the Validation of Text Information

Research in support of the D-ISC model suggests that message consistency (i.e., plausibility) and the messenger credibility (i.e., source credibility) can interactively affect text comprehension (e.g., Braasch et al., 2012). However, the focus of the D-ISC model lies on how the detection of an inconsistency, possibly as an outcome of the validation of text information, can induce strategic processing of the source information. However, less is known about the inverse relationship. How can the processing and evaluation of source information affect validation processes?

To date, only few studies have addressed this question by examining joint effects of source credibility and plausibility on validation. In a series of reading-time experiments, Sparks and Rapp (2011) presented interview transcripts to university students in which an interviewed person elaborated on certain character traits of a described person. The descriptions of the character traits could be summarized based on inferences (e.g., Chris is a cheater). The interviewed person was introduced as trustworthy (e.g., Quentin is honest and trustworthy) or untrustworthy (e.g., Zane is dishonest and untrustworthy). Later in the text, the described person acted either trait-consistent or -inconsistent. Reading times of the sentences entailing trait descriptions and the trait-consistent or -inconsistent behavior (i.e., target sentences) were analyzed. Focus on task demands was manipulated in the form of more explicit instructions and reading goals for participants from Experiment 1 to Experiment 4. In Experiment 1 to 3, Sparks and Rapp only found small effects of source credibility at the encoding level (i.e., on the trait description sentences) and no effects on comprehension of the target sentences. In Experiment 4, participants were explicitly instructed to judge the likelihood of future character actions, which in turn led to effects of source credibility on comprehension. Sparks and Rapp concluded that source credibility can affect comprehension but only under certain conditions (e.g., a specific reading goal).

To my knowledge, Foy et al. (2017) is the first study that directly tested the effects of plausibility and source credibility during text comprehension. Comparable to Sparks and Rapp (2011), Foy and colleagues operationalized source credibility with the trustworthiness dimension. However, sources were more salient in their experiments (i.e., they were more relevant for the story), more text information provided source information, and source information was closer to the claim and target sentences. Two reading-time experiments investigated possible effects of plausibility and source credibility for moment-by-moment processing. Participants read improbable (e.g., "He told her that her brakes were shot and needed to be replaced", Experiment 1) or probable story events (e.g., "He fixed her fan belt and told her that the traffic would be really bad on the way home", Experiment 2) asserted by either trustworthy (e.g., a befriended mechanic) or untrustworthy (e.g., fraudulent mechanic) sources. Stories continued with more information that could be consistent or inconsistent with the source's assertion (target sentence). Reading times of the assertion and spillover sentences as well as the consistent versus inconsistent target sentences were analyzed. The authors posited that readers validate the improbable (i.e., implausible) story events but additionally consider source credibility. In line with this assumption, the results suggest that source credibility can affect the validation of implausible story events. Reading times were faster for assertions and the subsequent (spillover) sentences from trustworthy sources as well as faster reading times for consistent target sentences. However, no effects of source credibility emerged for plausible story events. The findings of Foy et al. (2017) suggest that message plausibility and source credibility affect validation but to varying degrees. Plausibility seems to elicit stronger effects than source credibility. Moreover, the time course of validation appears to be affected as indicated by the spillover effects.

To conclude, the experiments by Foy and colleagues and Sparks and Rapp (2011) suggest that source credibility is evaluated in validation, but the extent of its affect on validation and boundary conditions that permit source credibility to affect validation

processes are less clear. However, theories and models of text comprehension within multiple

text comprehension (Chapter 2.3) and the dearth of research demonstrate the importance of

source information for theories of validation. Against this theoretical and empirical

background, the general assumptions and the rationale of the present research is justified in

the following chapter.

3   Present Research

In social psychology, the believability or validity of a message is often distinguished in two evaluative aspects: The credibility or the plausibility of the message and the credibility of the source conveying this message (Pornpitakpan, 2004; Self, 2009). Research on discourse processing indicates that the plausibility (property of text information) is often the primary criterion from which the validation of text information is drawn (see Chapter 2.2). The importance of source credibility for text comprehension (property of source information) as a means for readers to strategically (re)derive meaning from text information or texts has been emphasized in recent research (see Chapter 2.3). Moreover, the outcome of validation processes can trigger processes that induce the strategic processing and evaluation of source information as posited by the D-ISC model (Chapter 2.3.2). In particular, when readers encounter inconsistent or discrepant information, they are assumed to engage in sourcing processes that resolve the inconsistency and thus (re)establish coherence (e.g., Braasch et al., 2012). However, less research has investigated the inverse relationship of source credibility and validation (Chapter 2.4). Can the credibility of a source influence validation processes and if so, how?

Source credibility is conceptually related to the validity of a message or text information. Hence, the effect of source credibility on the validation of text information seems likely. This general assumption is embedded in a larger debate on the potential competition of contextual information and general world knowledge and their contribution to the fundamental processes of text comprehension in which source credibility is a specific type of contextual information (Chapter 2.2.3). Converging evidence shows that general world knowledge (i.e., plausibility) usually contributes more strongly to validation and comprehension (e.g., Cook & Guéraud, 2005; van Moort et al., 2021). However, in line with the RI-Val model (Chapter 2.2.1) and a growing body of evidence, strong contextual

information also exerts influence on validation (e.g., Colbert-Getz & Cook, 2013; Cook & Myers, 2004).

Against this theoretical and empirical background, this dissertation posits that although information plausibility (based on world knowledge and prior beliefs) is the guiding criterion for validation, source credibility as a specific type of contextual information might affect processing as an additional criterion, possibly in the form of a modulating role. In particular, source credibility might serve as a cue for readers depending on whether information conveyed by the source is believable. This cue might be more informative for information perceived as less plausible and serve to modulate the validation of inaccurate or inconsistent information (e.g., Braasch et al., 2012; Foy et al., 2017).

To this end, five experiments across three studies were conducted. In all experiments, participants read short texts with critical information (i.e., target sentences or messages) that varied in plausibility. Plausibility was operationalized as either information consistency with general world knowledge (Study 1 to 3) or the participants' beliefs and the belief conveyed in a text (text-belief consistency, Experiment 1 of Study 3). This critical information was provided by sources of varying credibility (high-credibility vs. low-credibility). Source credibility was based on the two core dimensions of source credibility (e.g., Pornpitakpan, 2004), that is, either the expertise (Study 1 and 2) or the trustworthiness dimension (Study 3). In Study 1 and 2, sources were introduced as protagonists in a short story that differed in their expertise level on a certain field of expertise (e.g., physics), often complemented by a fitting or non-fitting occupation (e.g., a university professor of astrophysics vs. a worker in an assembly line). In Study 3, sources were presented as official Twitter accounts of trustworthy versus untrustworthy organizations or media outlets (e.g., World Wide Fund for Nature or The Sun).

Collecting data from both online and offline measurements is a fruitful methodological approach in psycholinguistic research on comprehension processes such as validation (Rapp

& Mensink, 2011; see also Ferreira & Yang, 2019). Online measurements, such as reading

times, can capture moment-by-moment comprehension processes. Offline measurements,

such as prompts for readers to judge certain characteristics of the text after reading (i.e.,

offline), are potentially very informative about the reading outcomes. Consequently, an

approach combining online and offline measurements opens the opportunity to elucidate the

nature of the processes involved in validation and comprehension. To this end, reading times

served as an implicit (online) indicator of validation and plausibility ratings as an explicit

(offline) indicator of validation throughout all five studies. Ideally, explicit plausibility

judgments should mirror routine validation processes (e.g., Schroeder et al., 2008). This two-

fold approach is specifically informative for measuring the extent that moment-by-moment

processes captured by reading times converge with plausibility judgments. Moreover, it helps

to better interpret the meaning of reading times because they are often considered ambiguous

(e.g., Haberlandt, 1994; Kaakinen, 2017).

In line with the temporal assumptions of the RI-Val model (O'Brien & Cook, 2016a,

2016b), reading times of target and spillover sentences were analyzed as online indicators of

validation. Longer reading times of target and spillover sentences for world-knowledge or

text-belief inconsistent conditions compared with consistent conditions are usually interpreted

as instances of validation (e.g., similar to the contradiction paradigm; Cook & O'Brien, 2014).

Moreover, the present studies explored whether the reading times are additionally affected by

the credibility of the sources providing the consistent or inconsistent information. In a

separate task, participants explicitly judged the plausibility of the target sentences (or

messages) as an offline indicator of validation. Additionally, source credibility judgments

served as a manipulation check for the operationalizations of source credibility in all studies.

Two general hypotheses were proposed across all studies. First, the guiding role of

plausibility as the primary criterion for validation should lead to strong main effects of

plausibility as indicated by slower reading times and lower plausibility ratings with

decreasing plausibility. Second, the modulating role of source credibility should result in interaction effects of source credibility and plausibility with differences in reading times and plausibility ratings as a function of the fit between the perceived (im)plausibility of information and the credibility of the source.

The main goal of Study 1 was to investigate the interactive effect of plausibility and source credibility on validation. The design was comparable to Foy et al. (2017), which was the first study to directly examine the interplay of plausibility and source credibility for validation. In two experiments, participants read short narratives with a source introduced as a protagonist. Source credibility was varied via source descriptions of high- versus low-expertise sources. Plausibility was manipulated via world-knowledge consistency. Later in the narrative, the source provided a highly plausible (i.e., world-knowledge consistent) or highly implausible statement (i.e., world-knowledge inconsistent). Plausibility judgments (Experiment 1) and reading times of target and spillover sentences (Experiment 2) served as explicit and implicit indicators of validation. Additionally, global judgments assessed the meaningfulness and comprehensibility of the stories. Chapter 4 presents the study in detail.

Study 2 scrutinized the role of source credibility for validation in more detail. In particular, Study 2 examined whether the possible modulating effect of source credibility can be explained by the degree of (im)plausibility of the text information. In a related second goal, Study 2 aimed at integrating the seemingly divergent results of Foy et al. (2017) and Study 1. Accordingly, the design of Study 2 extended Study 1. In this experiment, a third intermediate level expanded plausibility with information that was factually false but conceptually closer to the accurate fact, deeming it somewhat implausible. Thus, plausibility varied between plausible (world-knowledge consistent), somewhat implausible (world-knowledge inconsistent but closer to the accurate fact), and highly implausible (clearly world-knowledge inconsistent) assertions. Similar to Study 1, source credibility was manipulated via expertise. Again, reading times of target and spillover sentences were analyzed as well as

plausibility judgments as implicit and explicit indicators of validation, respectively. As a manipulation check of the plausibility operationalization, participants judged the trustworthiness of the facts presented in the target sentences in a subsequent task. Chapter 5 presents the study in detail.

Study 3 built on the results of Study 1 and Study 2 and investigated the research questions in an ecologically more valid setting—a social media context. The main goal of Study 3 was to examine the interplay of plausibility and source credibility with a different text genre and with real-world sources such as Twitter messages by companies, organizations, and media outlets. Moreover, validation is assumed to draw on world knowledge but also on readers' belief as the epistemic background. In a second goal, Study 3 (Experiment 1) was the first to scrutinize the joint effects of source credibility and plausibility based on text-belief consistency. In two experiments, participants read short Twitter messages varying in text-belief consistency and world-knowledge consistency by trustworthy versus untrustworthy sources. Again, participants judged the plausibility of the message and the source credibility in a separate task. Chapter 6 presents the study in detail.

4 Study 1: Source Credibility Modulates the Validation of Implausible Information

Abstract

Validation of text information as a general mechanism for detecting inconsistent or false information is an integral part of text comprehension. This study examined how the credibility of the information source affects validation processes. Two experiments investigated combined effects of source credibility and plausibility of information during validation with explicit (ratings) and implicit (reading times) measurements. Participants read short stories with a high-credible vs. low-credible person that stated a consistent or inconsistent assertion with general world knowledge. Ratings of plausibility and ratings of source credibility were lower when a credible source stated a world-knowledge inconsistent assertion compared to a low credible source. [1]Reading times on target sentences and on spillover sentences were slower when a credible source stated an assertion inconsistent with world knowledge compared to a low credible source, suggesting that source information modulated the validation of implausible information. These results show that source credibility modulates validation and suggest a bidirectional relationship of perceived plausibility and source credibility in the reading process.

Keywords: Validation, Plausibility, Sourcing, Credibility, Text Comprehension

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[1] Correction based on a remark of PD Dr. Peter Marx: This is only true for plausibility ratings, but not for source credibility ratings. Source credibility ratings were higher for credible sources compared with low-credible sources, irrespective of world-knowledge consistency.

When readers read a text for comprehension, they continually build a mental representation of the situation described in the text (e.g., persons, events, actions, or state of affairs). This type of representation is called the situation model (van Djik & Kintsch, 1983; Zwaan & Radvansky, 1998) or mental model (Johnson-Laird, 1983). The construction of situation models during comprehension entails a mechanism of validation, that is, an evaluation of the plausibility of incoming information by determining its fit with the current situation model and accessible world knowledge (Richter, 2015). Various experimental approaches have provided evidence that readers continually evaluate text information based on activated world knowledge and contextual information (e.g., Cook & O'Brien, 2014; O'Brien & Cook, 2016a, 2016b; Richter et al., 2009; Singer, 2013). A strong body of evidence has accumulated for validation as a routine process and its importance for text comprehension (e.g., Ferretti et al., 2008; Maier & Richter, 2013; Rapp & Kendeou, 2009; Schroeder et al., 2008). However, research systematically mapping out the conditions that affect validation is fairly new. The conditions examined to date include the contributions of world knowledge and contextual information (e.g., Isberner & Richter, 2014; van Moort et al., 2018; Walsh et al., 2018; Williams et al., 2018), individual differences in working memory capacity and access to world knowledge (Singer & Doering, 2014), individual differences in beliefs (Gilead et al., 2019), developmental influences (Piest et al., 2018), text genre (such as fantasy text, Creer et al., 2018), and recency of text information (Guéraud et al., 2018).

One specific type of contextual information that might affect validation processes is the credibility of the source that provides the information. Information about source credibility can signal to the reader whether information provided by the source is believable and thus bears a strong conceptual relationship to the validity of information. Do readers consider source credibility during the validation of text information, and if they do, how does source credibility affect validation? This question is theoretically and practically relevant. A number of studies suggest that readers sometimes fall prey to obviously false information embedded

in fictional narratives, such as "The Atlantic is the largest ocean," and then use this information in later knowledge tests, although they know in principle that it is false (e.g., Rapp, 2008; Marsh & Fazio, 2006). Besides the plausibility of information, the credibility of the information source (e.g., a character who makes a statement) is a relevant cue that readers might rely on to guard themselves against misinformation. The extent that readers use this cue during validation is an open question. At a general level, the present study contributes to the question of how contextual information (e.g., discourse knowledge) and world knowledge are used and potentially compete against each other during text processing, an issue which has been highlighted in the RI-Val model (O'Brien & Cook, 2016a, 2016b).

Methodologically, two basic approaches are used to investigate comprehension processes such as validation. Researchers can investigate online processes during comprehension with implicit measurements such as reading times, which are informative with regard to moment-to-moment comprehension processes. Alternatively, researchers can ask specific questions or prompt readers to judge certain characteristics of the text, which are potentially very informative but must be collected offline (i.e., after reading), which limits their value for studying comprehension processes. An approach using both explicit (offline) judgments and implicit (online) measures allows examining their convergences and divergences (Rapp & Mensink, 2011). This approach offers a more complete picture of the nature of the processes involved in comprehension and a way to better understand the meaning of reading times that are notoriously ambiguous even in the context of validation.

The two experiments presented in this paper used short narratives and explicit and implicit measures of validation to test the hypothesis of an interactive effect of information plausibility and source credibility on validation. Both experiments used implausible information that was clearly inconsistent with general world knowledge (similar to Marsh & Fazio, 2006; Rapp, 2008). In the following section, we briefly discuss research on validation during comprehension, followed by a review of studies that have examined the role of source

credibility on text comprehension. Finally, to explain the background of the hypotheses tested in the two experiments, we discuss in detail the small body of extant studies that have examined combined effects of plausibility and source credibility.

Validation: Assessing the Plausibility of Information

Evidence has accumulated showing that readers routinely assess the plausibility of information during reading. Plausibility can be defined as the "acceptability or likelihood of a situation or a sentence describing it" (Matsuki et al., 2011, p. 926) or as "the degree of fit between a given scenario and prior knowledge" (Connell & Keane, 2006, p. 98). Consistent with these two definitions, plausibility can be seen as an assertion that varies along a continuum with true and false representing its endpoints.

Richter et al. (2009) introduced the epistemic Stroop paradigm, which aims at unravelling the nonstrategic, routine character of validation. The underlying logic of this paradigm is that reading a true (plausible) or false (implausible) sentence with regard to world knowledge should elicit an automatic response tendency depending on the plausibility of the information. This response tendency should interfere with an unrelated task, much like the interference effect underlying the original color-naming task invented by Stroop (1935). Several studies have found such epistemic Stroop effects with different stimuli and tasks. Richter et al. (2009) found this interaction pattern in two experiments with true vs. false statements. Further experiments have yielded epistemic Stroop effects for assertions of varying plausibility (Isberner & Richter, 2013) with belief-consistent and belief-inconsistent statements (Gilead et al., 2019), a nonlinguistic task (judging the color of a word; Isberner & Richter, 2013), a nonevaluative probe task (Isberner & Richter, 2014), and audiovisual information (Piest et al., 2018). These studies provide broad evidence for validation as a nonstrategic, involuntary process and for the assumption that validation produces implicit plausibility judgments and are more than mere disruptions of comprehension.

Further evidence for routine validation comes from experiments based on eye-tracking (Matsuki et al., 2011), event-related potential data (e.g., Ferretti et al., 2008), and reading times (e.g., Cook & O'Brien, 2014). For example, a typical finding from numerous experiments with the so-called inconsistency paradigm is that reading times are longer for sentences that conflict with information provided earlier in the text and pertinent prior knowledge (e.g., O'Brien et al., 1998). Singer (2006) showed that the pattern of the reading time for true vs. false affirmative and negated sentences mirrors the pattern in explicit verification judgments.

O'Brien and Cook (2016a, 2016b) proposed the Resonance-Integration-Validation Model (RI-Val), a comprehensive theory of comprehension in which validation plays a prominent role as pattern-matching process. This model assumes three types of processes: Resonance, integration and validation that are relevant for establishing a coherent representation during reading. All three processes are assumed to be passive, parallel and non-strategic, and asynchronous but overlapping, and they are assumed to run to completion. Incoming text information activates background knowledge (e.g., discourse and world knowledge) through a resonance-like process (cf. Myers & O'Brien, 1998; O'Brien & Myers, 1999). After a certain amount of knowledge has been activated through this resonance process (R), the next process of integrating the activated knowledge with the text information (I) begins. After integration has reached a sufficient conceptual overlap, the validation process (*Val*) begins by evaluating the activated, integrated information against activated relevant background knowledge. When validation has reached a sufficient level, called the coherence threshold, the reader can then process subsequent text information. The parallel but asynchronous fashion of activation, integration, and validation is a distinct assumption of the RI-Val model (Cook, 2014; Cook & O'Brien, 2014). The assumption implies that validation processes can take effect with a delay, such as a slow-down of reading at a spillover sentence following a critical sentence that conveys implausible information.

Recent studies have investigated these critical assumptions of the RI-Val model and influencing conditions of validation, such as the competition of contextual information vs. world knowledge or recency of information. When reading fantasy texts, readers are confronted with violations of real-world knowledge, yet they seem to have no comprehension difficulties. Walsh et al. (2018) investigated which source of information dominates validation with either fantasy-unrelated or fantasy-related inconsistencies in an extended fantasy narrative. Their experiments show that contextual information and world knowledge compete, but even if contextual information initially dominates validation, world knowledge can still influence comprehension. Using short texts about correct or incorrect historical events, van Moort et al. (2018) found distinct differences in text-based and knowledge-based monitoring that were biased by a context leading towards a correct or an incorrect event. Although contextual information and world knowledge had an effect on reading times of target sentences, only inconsistencies in world knowledge elicited spillover effects. Williams et al. (2018) investigated incomplete validation with semantic illusions (e.g., Moses illusion, Erickson & Mattson, 1981) embedded in narratives with varying contextual support, showing that both general world knowledge and contextual information can be (re)activated and influence comprehension. More importantly, their study presents evidence that readers are consistently disrupted by semantic illusions, even when semantic illusions are undetected.

To conclude, a growing body of empirical evidence suggests different time courses for integration and validation of contextual information and world knowledge. In line with the RI-Val model, both sources of information can influence validation. Effects of validation often occur at a delay, that is, at a spillover sentence following the critical information, which is in line with the idea of activation, integration, and validation as parallel but asynchronous processes.

Evaluation of Source Credibility

The credibility of an information source may be construed as a type of contextual information that bears a specific relationship to validation. Source credibility can depend on a variety of aspects associated with the communicator. Most conceptualizations of source credibility address the two dimensions of expertise and trustworthiness (Lombardi et al., 2014; Self, 2009). Our experiments focused on the expertise aspect of source credibility. Expertise in this context "refers to the extent to which a speaker is received to be capable of making correct assertions" (Pornpitakpan, 2004, p. 244). Evidence for the relevance of source credibility for text comprehension comes from research on the comprehension of multiple texts on the same topic (e.g., documents on a historical event, scientific texts dealing with the same phenomenon, or argumentative texts discussing the same political issue) from different perspectives (e.g., Bråten & Braasch, 2018). In multiple text comprehension, source characteristics (e.g., text type, author, language style, etc.) can be used as the basis for evaluations of source credibility, which is especially important to make sense of multiple texts with conflicting information. For example, Bråten et al. (2009) found an effect of source trustworthiness ratings on comprehension of multiple texts about climate change. Steffens et al. (2014) found less recall for low-credible sources (e.g., sources overstating results) than sources that presented evidence appropriately, showing to some extent a memory effect of source credibility. In sum, source credibility is recognized as an important variable in multiple text comprehension and the broader field of how people interact with information on the internet (e.g., Wathen & Burkell, 2002). However, a relative lack of studies has examined the role of source credibility in understanding information in single texts and its effects on comprehension processes.

Evaluation of Plausibility and Source Credibility

To date, few studies have examined the combined effects of source credibility and plausibility on validation and comprehension. Overall, the findings of this research are

inconclusive. In Sparks and Rapp (2011), participants read interview transcripts in four

reading time experiments in which information about a character was provided by the

interviewed person who was described as a credible (*honest* and *trustworthy*) or noncredible

(*dishonest* and *untrustworthy*) source. This character was described with a specific trait that

could be inferred from the text (e.g., being messy). Source descriptions varied in the

trustworthiness ascribed to the source, whereas source expertise was held constant. Later in

the texts, the reader learned whether the protagonist who was introduced in the beginning was

behaving in a manner that was either trait-consistent or inconsistent. The results of

Experiments 1 to 3 indicated little influence of source credibility at the encoding level. Only

when participants were instructed to explicitly judge the likelihood of future character

behaviors, source credibility significantly affected other processing stages. Sparks and Rapp

(2011) concluded that source credibility can influence text comprehension but only under

specific circumstances, for example, when readers follow a specific reading goal.

Braasch et al. (2012) provided source information within the text. Braasch and

colleagues conducted studies that focused on plausibility and source credibility in their

investigation of the discrepancy-induced source comprehension (D-ISC assumption), which

builds on the documents model framework. The D-ISC assumption holds that when readers

encounter discrepant (i.e., inconsistent) information in a text, they become more attentive to

sources, possibly in an attempt to resolve the discrepancy. To test this assumption, Braasch et

al. used brief news articles (two sentences) in an eye-tracking study, which presented two

sources (e.g., an art critic vs. a lighting technician) that made claims about various topics

(e.g., an opera show). The claims were either consistent or discrepant. Participants who

summarized texts with discrepant information reported more sources, had better memory for

discrepant versions, fixated source information more often, and spent more time on source

information. The basic idea of the D-ISC has been supported by a number of studies with

implausible (belief-inconsistent) information (e.g., Bråten et al., 2016; de Pereyra et al., 2014)

and discrepant information (e.g., discrepant claims, Kammerer et al., 2016; Rouet et al., 2016). These studies used different types of (single) texts, such as news reports or argumentative texts, and sometimes studied inconsistencies across multiple texts (e.g., Barzilai & Eshet-Alkalai, 2015; Kammerer & Gerjets, 2014; Strømsø et al., 2013).

Common to all of the studies on the D-ISC assumption is that they studied how discrepant or implausible information affects the processing of source information. In contrast, the present research sought to answer the question of how source information, particularly source credibility, affects the processing of implausible information (i.e., inconsistent information with general world knowledge). To our knowledge, Foy et al. (2017) were the first to address this question by investigating a proposed interactive effect between plausibility of information and source credibility. They conducted experiments with short narratives that included assertions (Experiment 1) or plausible assertions (Experiment 2) to shed light on a possible interplay between plausibility of text information and the credibility of its source. In the narratives used in Experiment 1, a trustworthy person (e.g., a sober person at a party) or an untrustworthy person (e.g., a person on drugs) stated an implausible assertion (e.g., that there are wolves in the yard). The stories continued with information that was either consistent or inconsistent with the implausible assertions. For example, a consistent continuation was a credible (sober) person who confirmed seeing wolves in the yard, whereas an inconsistent continuation was the credible person seeing just a few friends hanging out in the yard. Foy et al. argued that readers validate the implausible assertion but consider source credibility in this process. In line with this assumption, reading times of the implausible assertions and especially the subsequent (spillover) sentence were shorter when the assertions came from a trustworthy compared to an untrustworthy source. In contrast, reading times were shorter for consistent compared to inconsistent continuations in stories with trustworthy sources, whereas the pattern was reversed for untrustworthy sources. These results suggest that readers factored source credibility into validating implausible assertions in text narratives. Apparently, a

trustworthy source can make an implausible assertion appear more plausible, leading to a less severe disruption of text comprehension. Moreover, a trustworthy source can promote the acceptance of information and its integration into the situation model, which critically hinges on the outcome of the validation process (Schroeder et al., 2008). However, a slightly different pattern emerged when plausible assertions were used in Experiment 2 of Foy et al. (2017). Although plausible assertions were read faster when the source was a trustworthy compared to an untrustworthy source, no effects were found on the spillover sentence. In terms of the RI-Val model (O'Brien & Cook, 2016a, 2016b), this finding indicates a faster completion of the validation process for plausible sentences. Moreover, consistent continuations were always read faster than inconsistent continuations, suggesting that the plausible information was likely to be accepted and integrated in the situation model, regardless of source credibility. In sum, the experiments by Foy et al. (2017) show that message plausibility and source credibility each affect validation but not in the same way. The effect of message plausibility seems to exert somewhat stronger effects, and it appears to affect the time course of validation. However, given the potential importance of source information for theories of validation, further research on the role of source credibility in validation seems warranted.

Rationale of the Present Experiments

The present research aimed at examining how source credibility is considered in validation during comprehension. We used a strong manipulation of plausibility, contrasting highly implausible sentences that are inconsistent with general world knowledge (e.g., "The Atlantic is the biggest ocean in the world") and highly plausible sentences that are consistent with general world knowledge (e.g., "The Pacific is the biggest ocean in the world"; similar to Marsh & Fazio, 2006; Rapp, 2008). These assertions were embedded in short stories and stated by a person described as a source with a high or low level of expertise. Thus, we manipulated a different facet of source credibility than Foy et al. (2017), who focused on the

trustworthiness of sources. Third, we included online measures (reading times) but also as offline measures (plausibility judgments and source credibility judgments). This last part of the method provided a way to investigate possible convergences and discrepancies in moment-to-moment processes during reading and more global judgments after reading (Rapp & Mensink, 2011).

The general assumption was that textual information about source credibility, such as the expertise of a person, would affect the validation of the plausibility of the target statements. We conducted two experiments to gain a better understanding of the interplay between validation and source evaluation. Experiment 1 was based on explicit measures (plausibility and source credibility ratings), and Experiment 2 was based on implicit measures (reading times on target sentences and on spillover sentences). By including reading times for the spillover sentence in Experiment 2, we were able to further elucidate the time course of the combined effects of source credibility and plausibility in light of the RI-Val model proposed by O'Brien and Cook (2016a, 2016b). If source credibility is used in validation, the effects should also occur in the reading times for the spillover sentence, possibly even in a more pronounced fashion.

In the two experiments, the implausible assertions were clearly false, and the plausible statements were clearly true (i.e., consistent with world knowledge; assertions were located close to the endpoints of the plausibility continuum). Based on this stronger manipulation of plausibility, we expected a different pattern for the combined effect of plausibility and source credibility than Foy et al. (2017). In particular, we expected a highly implausible assertion (i.e., inconsistent with world knowledge) from a credible source to create an inconsistency at the discourse level, which should exacerbate (rather than mitigate) the disruption caused by the validation process and even increase its implausibility.

In Experiment 1, we expected readers to rate plausibility higher for assertions consistent with world knowledge (e.g., "Jupiter is the biggest planet in the Solar System") than for

assertions inconsistent with world knowledge (e.g., "The sun is the biggest planet in the Solar System"; Hypothesis 1). However, we also expected an interaction of plausibility and source credibility to emerge. For assertions inconsistent with world knowledge, a low-expertise source (e.g., a protagonist knowing almost nothing about astronomy and stars) should lead to higher plausibility ratings than a high-expertise source (e.g., a protagonist knowing very much about astronomy and stars), whereas the opposite pattern should occur for assertions consistent with world knowledge (Hypothesis 2).

We used the source credibility ratings obtained in Experiment 1 to explore whether plausibility also alters the perceived credibility of the source in Experiment 2. Generally, high-expertise sources should be rated as more credible than low-expertise sources. A test of this assumption can be seen as a kind of manipulation check for the source credibility manipulation. However, readers might evaluate source credibility not only based on source characteristics in the text, such as a person being described as a physics professor, but also based on the plausibility of the assertion stated by that person. Reading about a person who makes a false statement might cause readers to judge this person as less credible, regardless of the expertise level (Slater & Rouner, 1996). Finally, we assessed ratings of meaningfulness and comprehensibility for every story version to explore how these global judgments would depend on plausibility and source credibility. More importantly, the ratings of meaningfulness and comprehensibility were used to control for differences in these variables between the texts in the analyses of plausibility and source-credibility ratings in Experiment 1 and reading times in Experiment 2.

Experiment 1

Experiment 1 investigated the effects of source credibility and plausibility on explicit ratings of plausibility and source credibility. We expected a main effect of plausibility (Hypothesis 1) on plausibility judgments, and we expected the effect of plausibility to be

modulated by source credibility (Hypothesis 2). Additionally, readers evaluated the credibility

of the source and rated comprehensibility and meaningfulness of the stories.

Method

Participants

Sixty-seven undergraduates at the University of Würzburg (Germany) participated in

this study. The mean age was 22.48 years ($SD = 6.71$). Most participants were female (77%).

The data from four participants, who spoke a first language other than German, were excluded

from the analyses. Sixty-five participants received study credit, and two participants received

a monetary compensation (5 Euros) for participation.

Materials

We created 36 short stories about situations from everyday life, for example (e.g.,

vacations or restaurant visits; see Table 4.1 for an example). Each story consisted of eight

sentences. The first two sentences served as an introduction. The third sentence described the

protagonist either as a source with high credibility (a person with high expertise in a certain

field, e.g., a mineralogist) or with low credibility (a person with low expertise, e.g., a pool

attendant). The descriptions of expertise were explicit statements about the amount of

expertise in a field and included other information—for example, about the profession,

occupation, or academic title. The sixth sentence was the target sentence, which was an

assertion stated by the person introduced in the third sentence. The assertion could be

consistent (i.e., true) or inconsistent (i.e., false) with general world knowledge—for example,

"That's the Indian/Pacific Ocean, and it is between Africa and Australia." The world-

knowledge consistent and world-knowledge inconsistent assertions were partly based on

available general world knowledge norms (Nelson & Narens, 1980; Tauber et al., 2013) and

were extended with additional statements.

The possible combinations of source credibility and assertions about world knowledge

yielded four story versions, two consistent (source with high expertise and world-knowledge

consistent assertion, source with low expertise and world-knowledge inconsistent assertion)

and two inconsistent versions (source with high credibility and world-knowledge inconsistent

assertion, source with low credibility and world-knowledge consistent assertion). The seventh

(spillover sentence) and eighth sentences continued the story. The stories had an average

Flesch score (Flesch, 1948, German adaptation by Amstad, 1978) of 56.46 ($SD = 5.84$), which

translates to "demanding" or "fairly difficult" to read.

Table 4.1

Sample Experimental Story for Experiments 1 and 2

Introduction:
Sandra was visiting the planetarium in Bochum with her children, Eva and Torben. Both of
them were very curious and had a drive to learn.
Expertise
    Low expertise:
    Sandra had almost no knowledge about astronomy and stars.
    High expertise:
    Sandra had a lot of knowledge about astronomy and stars.
Continuation:
Because of that, she thought visiting a planetarium would be a great idea. On the way,
Sandra told her children what they could expect.
Assertion
    World-knowledge-consistent assertion:
    "Jupiter is the biggest planet in the Solar System", she said.
    World-knowledge-inconsistent assertion:
    "The Sun is the biggest planet in the Solar System", she said.
Spillover:
Eva and Torben were thrilled to get to know more.
Ending:
Sandra, Eva and Torben stayed the whole day at the planetarium.

Design

    The design was a 2 (source credibility: high vs. low expertise) x 2 (plausibility: world-

knowledge consistent vs. world-knowledge inconsistent assertion) within-subjects design.

Half of the participants provided plausibility ratings for the target sentence, and the other half

provided ratings of source credibility for the protagonist introduced in the third sentence. All

participants provided ratings of meaningfulness and comprehensibility for each story. A Latin

square with four different lists was used to counterbalance the assignment of stories to

experimental conditions across participants.

Procedure

The experiment was programmed and presented with the experimenter software

Inquisit 5. We instructed the participants to read the stories carefully and to rate either

plausibility of the stated assertions or the source credibility of a described source and

meaningfulness and comprehensibility of the stories. Participants read the stories on a

computer screen sentence-by-sentence in a self-paced fashion. They were tested in groups up

to four and gave informed consent before the experiment started. A fixation cross at the

location of the first word was displayed for 500ms. Participants could advance to the next

sentence by pressing the spacebar. Four practice trials were included at the beginning of the

experiment to familiarize participants with the self-paced reading method. Letters in all

sentences except the currently read one were masked with an "X". Participants read the stories

in a randomized order. Every participant could see every story in only one of the possible

versions. The procedure differed depending on which of the two rating tasks participants were

assigned to. Participants rated the source credibility of the protagonist after reading a story in

the self-paced fashion. The story was presented again but this time with all sentences

displayed at once and with the critical sentences (three and six) highlighted in blue. Below the

text, the question was presented, "How would you judge the credibility of the person

(highlighted in blue) as an information source regarding that topic?" Participants rated source

credibility on a scale from 1 (*not credible at all*) to 7 (*very credible*). Participants assigned to

the plausibility rating saw the question, "How would you judge the plausibility of this

assertion?" after they had read the sixth sentence (target sentence) and continued reading the

story afterwards. They rated plausibility on a scale from 1 (*not plausible at all*) to 7 (*very

plausible*). In addition, all participants rated the meaningfulness and comprehensibility of the

story on 7-point scales. The experiment lasted 30 min. On average, participants needed 24.17 min (SD = 3.47 min) to read and rate all 36 stories.

Results and Discussion

We excluded data for one story because of one incorrectly presented version. The remaining 35 stories received satisfactory ratings for meaningfulness (M = 5.97, SD = 1.23) and comprehensibility (M = 5.24, SD = 1.75).

We estimated linear mixed models with the lmer function of the R package lme4 version 1.1-17 (Bates et al., 2015) for all linear mixed models (Baayen et al., 2008) and the lsmeans function in the lsmeans package (Lenth, 2016) to further analyze interactions. The Type-I-Error probability was set at .05 (two-tailed) in all significance tests. We estimated effect sizes (Cohen's d) for differences in condition means based on the approximate formula proposed by Westfall et al. (2014) for linear mixed models with contrast-codes and single-degree-of-freedom tests (see also Judd et al., 2017).

Participants and stories were entered as random effects (random intercepts) in the models. The two independent variables were contrast coded and their main effects and their interaction were entered as fixed effects in the models. Sources with high credibility (high expertise) were coded as 1 and sources with low credibility (low expertise) were coded as -1. Assertions consistent with world knowledge (high plausibility) were coded as 1 and assertions inconsistent with world knowledge (low plausibility) were coded as -1. The position of a story in the experiment was entered as centered metric predictor in the model. The incentive type (course credit or money) did not affect the results, which remained intact when the type of incentive was statistically controlled in the models.
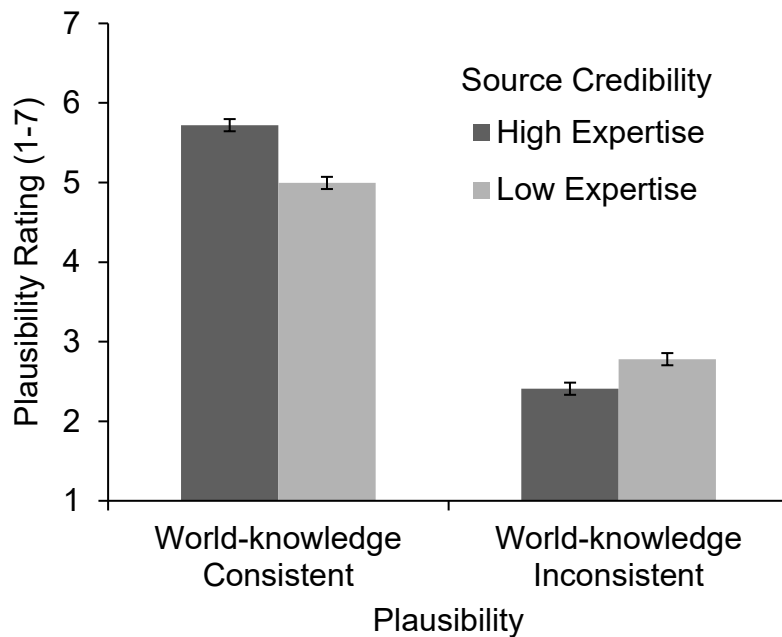
Plausibility Ratings

Plausibility ratings were available from 34 participants. We expected readers to rate the plausibility of assertions consistent with world knowledge higher than that of world-knowledge inconsistent assertions (Hypothesis 1). As expected, the analysis revealed a strong

main effect of plausibility, $\beta = 1.40$, $t(1078) = 27.03$, $p < .001$, $d = 1.50$. World-knowledge

consistent assertions led to higher plausibility ratings ($M = 5.36$, $SE = 0.13$) than assertions

inconsistent with world knowledge ($M = 2.56$, $SE = 0.13$). Analysis also revealed a (weaker)

main effect of source credibility, $\beta = 0.10$, $t(1078.8) = 1.99$, $p = .047$, $d = 0.11$. Assertions

stated by a high-credible source ($M = 4.06$ $SE = 0.13$) led to slightly higher plausibility ratings

than assertions stated by a low-credible source ($M = 3.86$, $SE = 0.13$). However, this main

effect was qualified by a significant interaction of plausibility and source credibility as

expected in Hypothesis 2, $\beta = 0.26$, $t(1079.4) = 4.99$, $p < .001$ (see Figure 4.1). When

participants rated the plausibility of an assertion that was inconsistent with world knowledge,

plausibility ratings were higher when this assertion was stated by a person with low expertise

($M = 2.72$, $SE = 0.15$) compared to the same assertion stated by a person with high expertise

($M = 2.41$, $SE = 0.15$), $t(1079) = -2.12$, $p = .035$, $d = -0.17$. In contrast, when participants

rated the plausibility of an assertion that was consistent with world-knowledge, plausibility

ratings were higher when this assertion was stated by a person with high expertise ($M = 5.72$,

$SE = 0.15$) compared to the same assertion stated by a person with low expertise ($M = 5.00$,

$SE = 0.15$), $t(1079) = 4.94$, $p < .001$, $d = 0.39$. Thus, participants considered the source

credibility for their explicit evaluations of the plausibility of information. In particular, the

consistency of source credibility and assertion plausibility seemed to matter, showing that

evaluating plausibility explicitly involves discourse knowledge (i.e., source credibility) and

world knowledge (i.e., world knowledge about facts presented in the assertions).

Figure 4.1

*Mean Plausibility Ratings (with Standard Errors) by Experimental Condition*

Source Credibility Ratings

Source credibility ratings were available from 29 participants. We found significant main effects for both independent variables (see Figure 4.2). As expected, the manipulation check confirmed the source credibility manipulation. Participants rated source credibility higher in stories with a high-expertise source ($M = 4.65$, $SE = 0.14$) compared to stories with a low-expertise source ($M = 3.30$, $SE = 0.14$), $\beta = 0.68$, $t(906.3) = 13.27$, $p < .001$, $d = 0.79$. Interestingly, stories with world-knowledge consistent assertions also led to higher ratings of source credibility ($M = 5.02$, $SE = 0.14$) than stories with world-knowledge inconsistent assertions and the effect was even stronger ($M = 2.93$, $SE = 0.14$), $\beta = 1.05$, $t(902.8) = 20.49$, $p < .001$, $d = 1.22$. The analysis revealed no significant interaction effect, $\beta = 0.04$, $t(906.3) = 0.76$, $p = .448$. In sum, persons with a high level of expertise in a certain field were rated more credible than persons with low expertise. Furthermore, participants seemed to take the plausibility of an assertion as an additional, if not to say the primary, source to evaluate source credibility regardless of expertise level (i.e., described source credibility). Participants

possibly used relevant world knowledge to validate the stated assertions and used this

comparison as a mean to evaluate source credibility.

Figure 4.2

Mean Source Credibility Ratings (with Standards Errors) by Experimental Condition
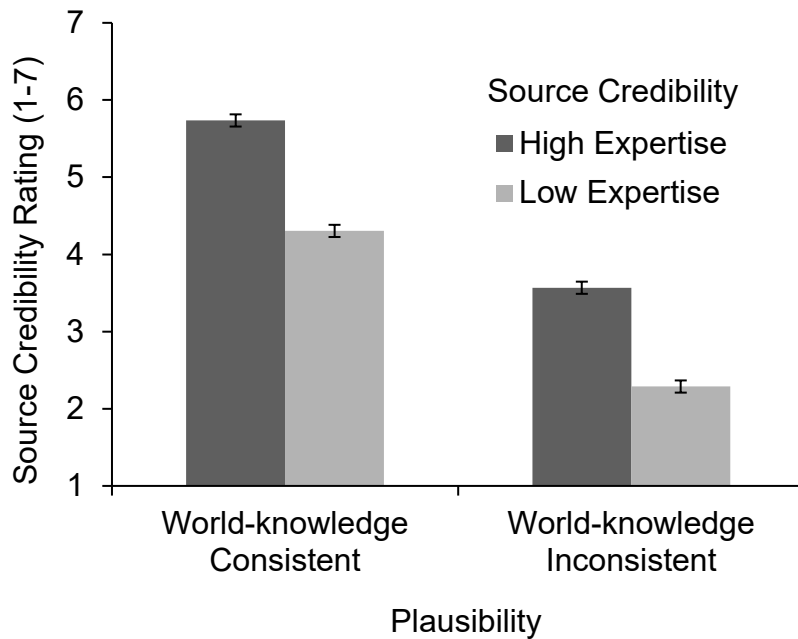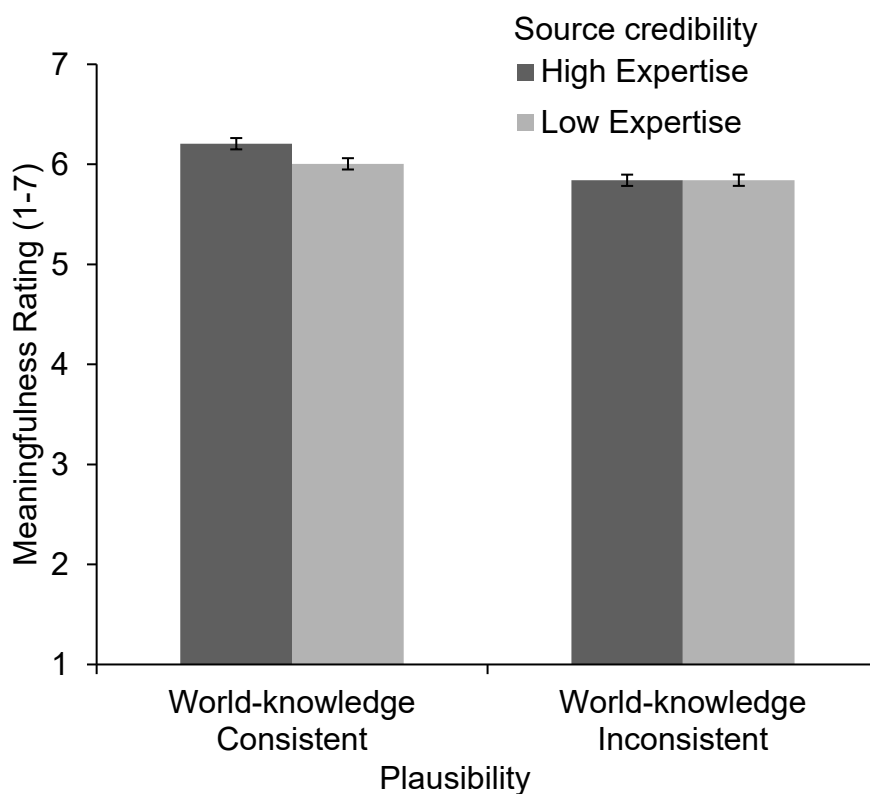

Meaningfulness Ratings

Meaningfulness ratings were available from 63 participants. The results by

experimental condition are displayed in Figure 4.3. A significant effect of position was found,

$\beta = -0.04$, $t(2038.5) = -2.08$, $p = .037$. Participants rated stories presented in the beginning of

the experiment slightly higher than stories presented later, possibly because of fatigue or

boredom effects. Moreover, we found small main effects for both independent variables.

Stories containing high-expertise sources ($M = 6.02$, $SE = 0.11$) led to higher meaningfulness

ratings than low-expertise sources ($M = 5.92$, $SE = 0.11$), $\beta = 0.05$, $t(2007.1) = 2.60$, $p = .009$,

$d = 0.08$. In a similar pattern, stories with world-knowledge consistent assertions led to higher

meaningfulness ratings ($M = 6.11$, $SE = 0.11$) than world-knowledge inconsistent assertions

($M = 5.84$, $SE = 0.11$), $\beta = 0.13$, $t(2006.8)$, $p < .001$, $d = 0.22$. Furthermore, a significant

interaction effect was found, $\beta = 0.05$, $t(2006.4)$, $p = .011$. Stories with world-knowledge

consistent assertions were rated as slightly more meaningful when the assertions were stated by a high-expertise source ($M = 6.21$, $SE = 0.11$) compared to a low-expertise source ($M = 6.01$, $SE = 0.11$), $t(2007) = 3.64$, $p < .001$, $d = 0.17$. In world-knowledge-inconsistent assertions, no difference was found in the meaningfulness ratings for stories containing a low credibility source and a high credibility source, $t(2007) = 0.03$, $p = .98$. Thus, readers considered source credibility when required to rate the meaningfulness of stories that had a world-knowledge consistent assertion.

Figure 4.3

Mean Meaningfulness Ratings (with Standards Errors) by Experimental Condition
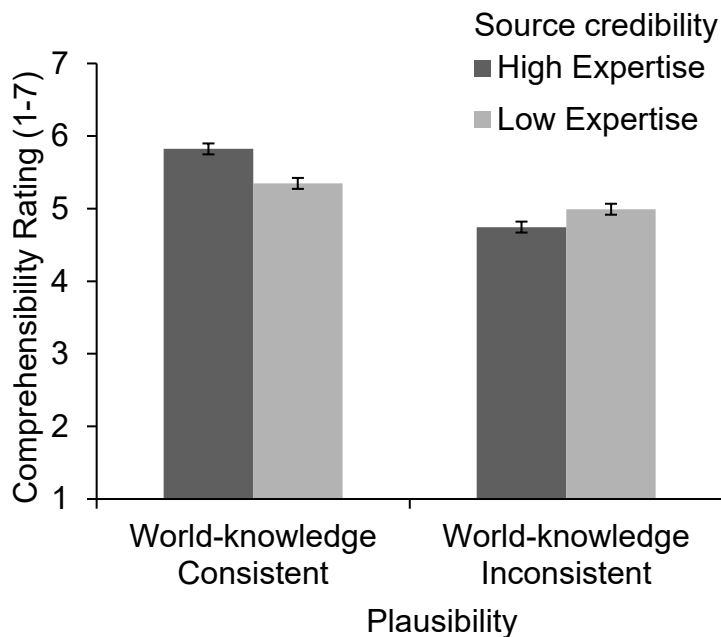

Comprehensibility Ratings

Comprehensibility ratings were available from 63 participants. The results by experimental condition are displayed in Figure 4.4. The position of a story again had a significant effect on the ratings, $\beta = -0.06$, $t(2036.7) = -2.01$, $p = .044$. Earlier stories led to

higher comprehensibility ratings than later stories. Moreover, we found a significant main effect of source credibility, $\beta = 0.06$, $t(2003.4) = 2.00$, $p = .046$, $d = 0.08$. Stories containing a high-expertise source ($M = 5.29$, $SE = 0.14$) led to slightly higher comprehensibility ratings than stories containing a low-expertise source ($M = 5.17$, $SE = 0.14$). We also found a significant main effect of plausibility, $\beta = 0.36$, $t(2002.9) = 12.23$, $p < .001$, $d = 0.58$. Stories with a world-knowledge consistent assertion ($M = 5.59$, $SE = 0.14$) led to higher comprehensibility ratings than stories with a world-knowledge inconsistent assertion ($M = 4.87$, $SE = 0.14$). The analysis revealed a significant interaction effect, $\beta = 0.18$, $t(2002.5) = 6.19$, $p < .001$. Again, stories with world-knowledge consistent assertions were rated as slightly more comprehensible when the assertions were stated by a high-expertise source ($M = 5.82$, $SE = 0.15$) compared to a low-expertise source ($M = 5.35$, $SE = 0.15$), $t(2003)=5.79$, $p < .001$, $d = 0.39$. In contrast, for stories with world-knowledge inconsistent assertions, high-expertise sources led to lower comprehensibility ratings ($M = 4.75$, $SE = 0.15$) than stories with low-expertise sources ($M = 4.99$, $SE = 0.15$), $t(2003) = -2.97$, $p = .003$, $d = -0.20$.

In sum, the higher ratings for comprehensibility on consistent stories reflect to some extent the fit between source credibility and the plausibility of an assertion.

Figure 4.4

Mean Comprehensibility Ratings (with Standards Errors) by Experimental Condition

Plausibility Ratings (Comprehensibility and Meaningfulness Controlled for)

Given that the patterns of results obtained for comprehensibility and meaningfulness partially resembled the results obtained for the focal dependent variable plausibility, we reran the analyses controlling for comprehensibility and meaningfulness by including these ratings as centered predictors in the models. The model revealed a positive association of comprehensibility and plausibility ratings ($\beta = 0.74$, $t(1041) = 11.93$, $p < .001$). Importantly, however, the effects relevant for the hypotheses, that is, the main effect of plausibility ($\beta = 1.20$, $t(1092) = 23.98$, $p < .001$, $d = 1.40$) and the interaction of plausibility and source credibility ($\beta = 0.18$, $t(1074) = 3.73$, $p < .001$) remained intact. These results suggest that the plausibility ratings are not identical with global comprehension but reflect judgments specific to validation.

In sum, the results of Experiment 1 show that readers evaluate and weigh source credibility in their explicit judgments of information plausibility. Apparently, the consistency of source information and plausibility matters. Credible sources boost the perceived

plausibility of plausible information but lower the perceived plausibility of implausible information. A similar but less pronounced pattern was found for comprehensibility and to a smaller extent (and only for stories with world-knowledge inconsistent assertions) for meaningfulness ratings. Assuming that these ratings reflect metacognitive judgments of successful comprehension, our findings underscore the relevance of validation (as reflected in the plausibility ratings) for comprehension and the strong relationship between validation and integration (e.g., Richter, 2015).

Lastly, not only was perceived plausibility affected by source credibility, but plausibility also affected the perceived source credibility. This exploratory finding suggests that source credibility and plausibility might have a more dynamic relationship than commonly assumed.

Experiment 1 investigated offline outcomes of validation by employing explicit measurements of plausibility and source credibility judgments. The findings of Experiment 1 are informative with regard to validation insofar as nonstrategic validation processes are assumed to feed into explicit plausibility judgments (e.g., Schroeder et al., 2008). However, the offline judgments collected in Experiment 1 are also likely to involve reflective processes and are based in part on the global impression of the situation described in the story. Thus, to gain a clearer picture of the moment-to-moment processes involved in validation and the role of source credibility in these processes, we conducted Experiment 2, which included reading times as implicit indicators of validation.

Experiment 2

Experiment 2 was highly similar to Experiment 1, but the dependent variables were reading times for the target sentences, which varied in plausibility, and reading times for spillover sentences (i.e., the sentences immediately following the target sentence). Reading times for spillover sentences were examined to shed light on the time course of using source

credibility when forming plausibility judgments in the nonstrategic validation process as defined by the RI-Val model.

The general expectation was that the pattern of results for the reading times obtained in Experiment 2 would mirror the results found for the plausibility ratings in Experiment 1. Specifically, we expected readers to process assertions that are consistent with world knowledge faster than assertions that are inconsistent with world knowledge (Hypothesis 3a). Longer processing times for world-knowledge inconsistent assertions have been shown numerous times with the contradiction paradigm (see Cook & O'Brien, 2014, for an overview) and are usually interpreted as indicating the detection of the implausibility through validation. More importantly, however, we expected plausibility to interact with source credibility. A matching combination of source credibility and plausibility should lead to faster reading times because world knowledge and discourse knowledge align, allowing faster validation. In contrast, a mismatching or inconsistent combination of source credibility and plausibility should lead to slower reading times compared to the consistent combination. For example, the consistent combination of an expert on the topic of astronomy and stars (high-expertise source) stating that Jupiter is the biggest planet in the Solar System (consistent with world knowledge) should lead to faster reading times than a low-expertise source stating a fact that is world-knowledge consistent. On the other hand, a matching combination of a non-expert on the topic of astronomy and stars, stating that the sun is the biggest planet in the Solar System should lead to faster reading times compared to an expert stating a fact that is world knowledge inconsistent (Hypothesis 4a).

The RI-Val model (O'Brien & Cook, 2016a; 2016b) assumes that resonance, integration, and validation processes are asynchronous, parallel, and passive, and that they run to completion. In line with these critical assumptions, the expected effects on target sentences should also be revealed on the subsequent (i.e., spillover) sentences. Moreover, if the temporal assumptions of the RI-Val model hold, the effect on the spillover sentences might be

even more pronounced than on the target sentence. We expected reading times of the spillover sentence to be slower for world-knowledge inconsistent compared to world-knowledge consistent assertions (Hypothesis 3b) and an interaction of plausibility and source credibility, with consistent combinations of source credibility and plausibility leading to faster reading (Hypothesis 4b). Given that such delayed effects are particular to validation (according to the RI-Val model) and not so much to integration or activation, this pattern of effects would specifically corroborate the general assumption that source credibility affects validation.

Method

Participants

We recruited 68 participants with an average age of 25.75 years ($SD = 7.68$ years). Most participants were students from the University of Würzburg (82%) and female (75%). We used the online participant management software at the University of Würzburg (SONA Systems) to recruit participants. Four participants reported a first language other than German; one participant reported a language impairment. The data from these participants were excluded from the analyses. Participants received 7 Euros for participation.

Materials

We selected 28 of the 36 stories from Experiment 1 for inclusion in Experiment 2. For all 28 stories, significant differences were found in plausibility ratings between the story versions with world-knowledge consistent vs. world-knowledge inconsistent assertions and significant differences in source credibility ratings between the version with the high-credible and the low-credible sources. The length (mean number of characters) was comparable across the experimental story versions (high expertise – world-knowledge consistent assertion: $M = 635.34$, $SD = 76.91$; high expertise – world-knowledge inconsistent assertion: $M = 633.79$, $SD = 76.37$; low expertise – world-knowledge consistent assertion: $M = 635.42$, $SD = 77.26$; low expertise – world-knowledge inconsistent assertion: $M = 634.63$, $SD = 78.17$). On average, the experimental stories had a Flesch score (Flesch, 1948; German adaptation by Amstad,

1978) of 56.22 (*SD* = 5.83) comparable to Experiment 1. Thus, the stories were "demanding"

or "fairly difficult to read". We translated and adapted 20 filler stories from Foy et al. (2017).

The filler stories consisted of eight sentences with topics and linguistic characteristics

comparable to the experimental stories. The filler stories had no explicit descriptions of

expertise and no direct speech. All filler stories were plausible.

Norming Study

We conducted a (post hoc) norming study with the selected 28 stories from

Experiment 1 (plus eight additional stories required for an independent study) to confirm that

the high- and low-credible story versions differed in perceived credibility between the two

sources. The participants (*N* = 48) were mostly female (87.5%) and undergraduates from the

University of Würzburg and were reimbursed with 5 Euros. The average age was 23.38 (*SD* =

6.27). Participants read the 36 stories in a randomized order and rated plausibility (1 = "very

implausible" to 7 = "very plausible") of the assertions and credibility of the introduced source

(1 = "not credible at all" to 7 = "very credible") with respect to the field of expertise

associated with the assertion. Presentation of story versions and the order of the two rating

tasks were counterbalanced across participants. High-expertise sources received significantly

higher source credibility ratings (*M* = 4.56, *SE* = 0.15) than low-expertise sources (*M* = 3.29,

SE = 0.15), β = 0.63, *t*(811.4) = 10.10, *p* < .001, *d* = 0.68.

Design

The design was a 2 (source credibility: high expertise vs. low expertise) x 2

(plausibility: world-knowledge consistent vs. world-knowledge inconsistent assertion) within-

subjects design. Each participant read one version of every story. We counterbalanced the

assignment of stories to experimental conditions across participants via a Latin Square (four

different lists). The dependent variable was reading time per sentence (in ms) for the target

sentence and the subsequent sentence (spillover sentence). Each participant read the stories in

a randomized order.

Procedure

Participants were tested in groups of up to eight people and gave informed consent. Their instruction was to read the stories for comprehension and to answer questions after some of the stories. The software Inquisit 5 was again used for presenting the stimuli and recording the dependent variables. Participants read all 48 stories on a computer screen in a self-paced manner identical to Experiment 1. Four practice trials were included at the beginning. After every filler story, participants responded to a yes/no comprehension question (e.g., "Was Maria prepared for her son's birthday?"). The correct answer to half of the questions was yes. The experiment lasted approximately 30 min. Participants needed on average 25.37 min (*SD* = 6.06) to read all 48 stories.

Results and Discussion

In addition to the data obtained from the four nonnative speakers and the participant with a reported language impairment, data from two participants were excluded because a software error occurred during the experiment. Moreover, two participants with an accuracy below 70% in the comprehension questions were also excluded. The final sample consisted of 59 participants with a mean accuracy of 87.91% (*SD* = 7.53) on the comprehension questions. Reading times outside the interval defined by 3 *SD* above or below the participant or item mean were treated as missing values (33 data points or 1.2% of the data points for target sentences, six data points or 0.3% for spillover sentences). Reading-time data of target sentences and spillover sentences were analyzed with linear mixed models with random effects (random intercepts) of participants and stories (Tables 4.2 and 4.3). We entered main effects as well as the interaction of both factors as fixed effects in the model. Contrast-coding was used as in Experiment 1. Additionally, we entered sentence length and the position of the story in the experiment as centered predictors (fixed effects) to control for item length and position effects.

Target Sentences

The sentence length and the position of the story in the experiment had a significant effect on reading times. Longer target sentences led to slower reading times, β = 536.64, t(31.9) = 7.39, p < .001. Participants needed more time to read target sentences in stories presented earlier in the experiment, β = -291.01, t(1539.7) = -10.48, p < .001. As predicted in Hypothesis 3a, we found a significant main effect of plausibility, β = -207.54, t(1547.7) = -7.56, p < .001, d = -0.29. World-knowledge inconsistent sentences (M = 3764 ms, SE = 136 ms) were read more slowly than world-knowledge consistent sentences (M = 3349 ms, SE = 136 ms). More importantly, the interaction effect of plausibility and source credibility predicted in Hypothesis 4a emerged, β = -60.85, t(1529) = -2.23, p = .026. The pattern of the interaction (see Fig. 5) partly mirrored the interaction found in Experiment 1 for the explicit plausibility ratings. Reading times for world-knowledge inconsistent sentences were slower when combined with a source with high (M = 3856 ms, SE = 141 ms) compared to low credibility (M = 3673 ms, SE = 141 ms), t(1529) = 2.36, p = .019, d = 0.13. Reading times for target sentences that were consistent with world knowledge where slightly faster when combined with a source with high credibility (M = 3319 ms, SE = 141 ms) compared to a source with low credibility (M =3379 ms, SE = 141 ms), but this difference was not significant, t(1529) = -0.79, p = .42. These results provide partial support for Hypothesis 4a. Information about source credibility seems to modulate the nonstrategic validation of implausible information.

Table 4.2

Estimated Coefficients, Standard Errors, Degrees of Freedom, and t Values for the Linear

Mixed Model of the Reading Times of the Target Sentence in Experiment 2

	Est.	*SE*	*df*	*t*	
(Intercept)	3556.64	133.14	76.97	26.71	***
Length of Sentence	536.64	72.65	31.94	7.39	***
Position	-291.01	27.76	1539.68	-10.48	***
Source Credibility	30.48	27.30	1529.27	-1.12	
Plausibility	-207.54	27.46	1547.65	-7.56	***
Source Credibility x Plausibility	-60.85	27.29	1528.95	-2.23	*

Note. Source Credibility (contrast coded: high expertise = 1, low expertise = -1). Plausibility

(contrast coded: world-knowledge consistent = 1, world-knowledge inconsistent = -1).

* *p* < .05, ** *p* < .01, *** *p* < .001.

Figure 4.5

Mean Reading Times on Target Sentence (with Standards Errors) by Experimental Condition
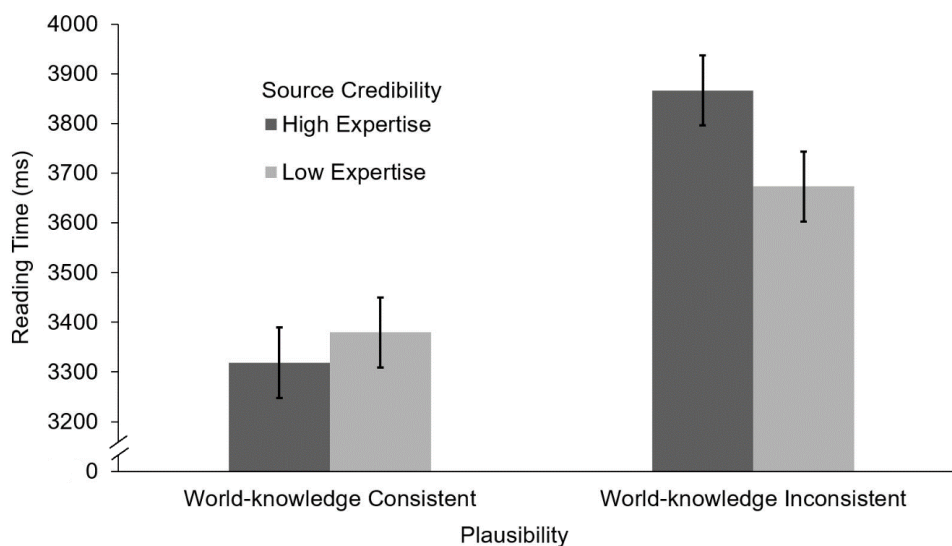
Spillover Sentences

We expected similar and potentially even more pronounced effects to occur for spillover sentences. Sentence length and position of the story in the experiment exerted significant effects on reading times. Longer spillover sentences led to higher reading times (β = 455.91, $t(25.9)$ = 10.84, $p < .001$). The same was true of stories presented earlier in the experiment (β = -198.43, $t(1554.4)$ = -11.00, $p < .001$). In addition, the analysis revealed a significant main effect of plausibility (Hypothesis 3b), β = -37.30, $t(1541.3)$ = -2.10, $p = .036$, d = -0.08 and no main effect of source credibility, β = 19.79, $t(1540.7)$ = 2.12, $p = .265$. Spillover sentences subsequent to world-knowledge-inconsistent target sentences led to slower reading times (M = 2531 ms, SE = 82 ms) than spillover sentences subsequent to world-knowledge-consistent target sentences (M = 2457 ms, SE = 82 ms). More importantly, the expected interaction of source credibility and plausibility on reading times of the spillover sentences (Hypothesis 4b) was significant, β = -58.27, $t(1540.6)$ = -3.29, $p = .001$ (see Fig. 4.6). Reading times for spillover sentences following a world-knowledge-inconsistent target sentence were slower when combined with a source with high compared (M = 2609 ms, SE = 86 ms) to low credibility (M = 2453 ms, SE = 86 ms), $t(1541)$ = 3.11, $p = .002$, d = 0.17. In contrast, spillover sentences following a world-knowledge-consistent target sentence combined with a high credibility source (M = 2418 ms, SE = 86) led to faster reading times than spillover sentences following a world-knowledge-consistent target sentence combined with a low credibility source (M = 2610, SE = 86), but this difference failed to reach significance, $t(1541)$ = -1.54, $p = .124$. Thus, Hypothesis 4b regarding the modulating role of source credibility for validation was again partially supported. Evidence was found for the claim that source credibility modulated the validation of implausible assertions.

Table 4.3

Estimated Coefficients, Standard Errors, Degrees of Freedom, and t Values for the Linear

Mixed Model of the Reading Times of the Spillover Sentence in Experiment 2

	Est.	*SE*	*df*	*t*	
(Intercept)	2494.15	80.29	75.46	31.06	***
Length of Sentence	455.91	42.05	25.92	10.84	***
Position	-198.43	18.03	1554.35	-11.00	***
Source Credibility	19.79	17.73	1540.66	1.12	
Plausibility	-37.30	17.74	1541.25	-2.10	*
Source Credibility x Plausibility	-58.27	17.73	1540.59	-3.29	**

Note. Source Credibility (contrast coded: high expertise = 1, low expertise = -1). Plausibility

(contrast coded: world-knowledge consistent = 1, world-knowledge inconsistent = -1).

* *p* < .05, ** *p* < .01, *** *p* < .001.
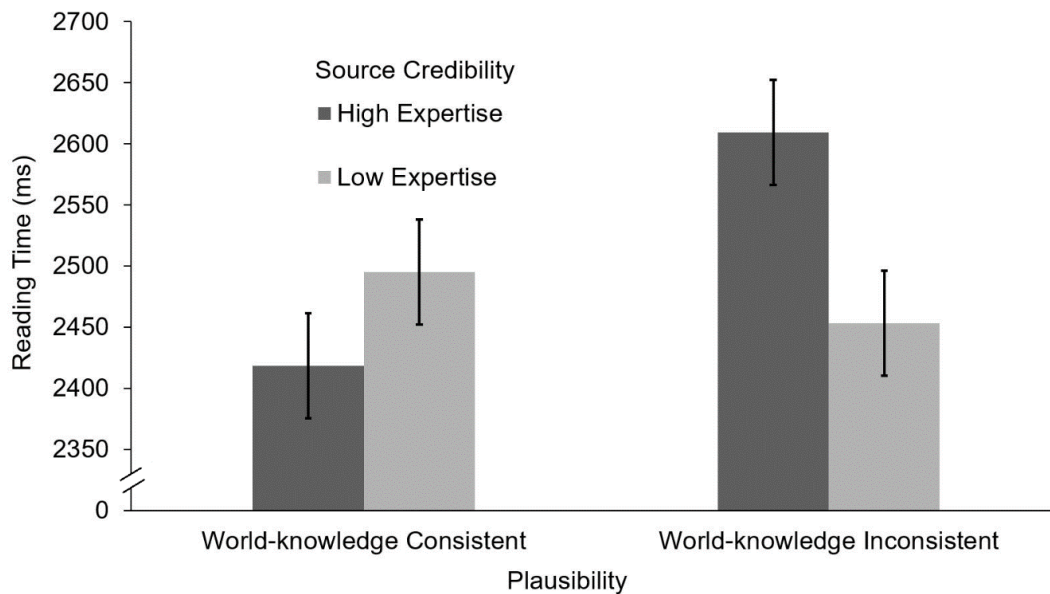
Reading Times for Target and Spillover Sentences (Controlling for Mean

Comprehensibility and Meaningfulness)

We reran the analyses controlling for the mean comprehensibility and meaningfulness ratings obtained for each story in Experiment 1 to assess the potential influence of these variables on the reading times for target and spillover sentences. The mean ratings were included as centered predictors in the models. The analyses provided no evidence for effects of comprehensibility and meaningfulness on the reading times for the target sentence or the spillover sentence (for all effects, $p > .352$). The effects relevant for the hypotheses remained largely intact. The main effect of plausibility on the reading times was still significant for the target sentence ($\beta = -211.85$, $t(1553.7) = -4.99$, $p < .001$, $d = -0.30$.) but not for the spillover sentence ($\beta = -22.56$, $t(1544.5) = -0.83$, $p = .410$). Importantly, however, the interaction of plausibility and source credibility (predicted by Hypotheses 4a and 4b) was significant in the model for the target sentence ($\beta = -66.47$, $t(1561.4) = -2.06$, $p = .040$) and in the model for the spillover sentence ($\beta = -49.16$, $t(1572.5) = -2.36$, $p = .019$). These results suggest that the pattern of reading times, especially the focal interaction of source credibility and plausibility, cannot be explained by differences in perceived comprehensibility and meaningfulness between the stories.

The similar pattern of results for target and spillover sentences lends further support to the assumption that source credibility is used in the validation of information. Moreover, the fact that the pattern was even more pronounced for the spillover sentences is in line with the RI-Val model (O'Brien & Cook, 2016a; 2016b) that validation processes start later than (but parallel to) integration processes and run to completion. However, evidence for a modulating effect of source information on validation were found only for world-knowledge inconsistent sentences, where a low-expertise source reduced the slow-down in reading typical found for knowledge-inconsistent information.

General Discussion

The present experiments examined the possibility that world knowledge and source credibility jointly influence the validation of text information. Participants read short narratives with high or low-credible sources that stated information that was consistent or inconsistent with world knowledge. In Experiment 1, we used plausibility and source credibility ratings as an explicit measurement of evaluation. In Experiment 2, we used reading times of the target and spillover sentences as an implicit online measurement of validation.

In line with our predictions, we found strong main effects of plausibility on the plausibility ratings (Hypothesis 1) and on reading times for the target sentences, whose plausibility was varied (Hypothesis 3a), and for the subsequent spillover sentence (Hypothesis 3b). Moreover, we found a significant interaction effect of source credibility and plausibility with both explicit and implicit measurements. In line with Hypothesis 2, participants rated world-knowledge inconsistent assertions as less plausible when the assertions came from a high-credible source compared to low-credible source. Supporting Hypothesis 2 further, participants also rated world-knowledge consistent assertions as more plausible when the assertions came from a high-credible source compared to a low-credible source. Similarly, and in line with Hypotheses 4a and 4b, participants read the target and the subsequent spillover sentences more slowly when a high-credible source stated world-knowledge inconsistent information compared to a low-credible source stating this information. These findings provide evidence for a possible modulating effect of source credibility on validation for world-knowledge inconsistent sentences.

The Different Roles of Source Information and World-Knowledge in Validation

Together, Experiments 1 and 2 show a convergence of online and offline indicators of validation for world-knowledge inconsistent sentences but not for world-knowledge consistent sentences. Assertions that were consistent with world knowledge were rated as less plausible when they came from a low-expertise source, but the expertise of the source did not

affect moment-to-moment reading times of the target and the spill-over sentence, which we interpret as indicators of validation during reading. On the one hand, the similar patterns of plausibility judgments and reading times for world-knowledge inconsistent information lend support to the conclusion that the slow-down in reading times reflects validation processes, in particular the (implicit) detection of inconsistencies of information with world knowledge and the current discourse context. On the other hand, the divergent results for the world-knowledge consistent information might be explained by different processing foci and processing modes, a more local and passive mode for the reading times and a more global and reflective mode for the plausibility judgments (for a similar line of reasoning, see Egidi & Gerrig, 2006; Foy & Gerrig, 2014; Rapp & Mensink, 2011; Sparks & Rapp, 2011). Apparently, source information is only considered in moment-by-moment validation processes when an inconsistency of text information and knowledge occurs. In other words, world-knowledge consistency is the primary criterion used in validation, and source information, as a special kind of contextual information, is considered only when validation has revealed an inconsistency. In terms of the RI-Val model (O'Brien & Cook, 2016), source information is a kind of text contextual information that potentially competes with world knowledge that is the primary source of validation. Apparently, the contextual influence of source information is not strong enough to overturn the influence of activated world knowledge when the text information is consistent with that knowledge. In this case, the coherence threshold is reached quickly and readers move on to the next sentence. However, source information can influence the validation process when there is a mismatch between world knowledge and text information. In that case, it takes longer to reach the coherence threshold, which enables source information to take effect. It must be noted that this interpretation in terms of the RI-Val model, plausible as it may be, is mostly speculative at this point. Further experiments with methods allowing a more fine-grained analyses of the

time course of using source information (such as eye-tracking methods) might be helpful to elucidate these issues.

The effects on the spillover sentences are also consistent with the critical assumptions of the RI-Val model (O'Brien & Cook, 2016a; 2016b), which states that activation, integration, and validation are parallel and asynchronous processes that run to completion. In line with the model, the joint impact of plausibility and source information lingered even after readers had moved on to the spillover sentences, which were identical across story versions. The interaction of plausibility and source credibility even became clearer on the spillover sentences, which is well in line with the temporal assumptions of the RI-Val model and our basic assumption that source credibility is a contextual factor that modulates the validation of text information.

Effects of Source Information on Validation Might Depend on the Degree of (Im-) Plausibility and Semantic Overlap

To our knowledge, Foy et al. (2017) is the only study that presented evidence for the combined effects of source credibility and plausibility on validation, with high-credible sources mitigating the disruptive effects of implausible assertions on the comprehension process. At first sight, these findings might seem inconsistent with our finding that high-credible sources boosted the implausibility of implausible information. However, a key to understanding the differences lies in the type of implausibility used in the experiments by Foy et al. and our experiments. Foy and colleagues used sentences that described improbable events (e.g., a protagonist seeing a wolf in the backyard) for which the truth value of the sentences could not be determined by participants. Participants were thus required to infer the probability of the situation described in the critical assertion (e.g., "there are wolves in the backyard") based on contextual information (e.g., the conversation takes place at a party) and associated prior knowledge (e.g., schematic knowledge about typical parties). The more prominent role of contextual information might have prompted participants to rely more

strongly on source credibility cues, which may be construed as a specific type of contextual information, for validating the assertion. In contrast, participants in our experiments read sentences that could be judged as true or false based on world knowledge. Therefore, high-credible sources were perceived as inconsistent with world-knowledge inconsistent assertions rather than boosting their plausibility.

Thus, the size and the direction of the interactive effect of plausibility and source credibility possibly depend on the role of contextual knowledge and the degree of plausibility. According to social judgment theory (e.g., Sherif & Sherif, 1967; Sherif et al., 1965), judgments of belief-relevant information occur on a continuum with latitudes of acceptance, rejection, and noncommitment. A similar continuum might hold for validation, and source information would be most relevant for the validation of information that falls into the area of noncommitment, which implies uncertainty. To directly test this assumption, future research should vary plausibility within the same experiment—for example, with assertions gradually varying in plausibility. We expect that with increasing plausibility, the influence of source credibility would decrease and that credible sources would mitigate the disrupting effects of implausible assertions but only up to a certain degree of implausibility. When the implausibility exceeds this threshold (as was presumably the case in the implausible statements used in our experiments), credible sources would increase the disrupting effect of implausible information. Preliminary evidence for the fruitfulness of this approach comes from Foy et al. (2017, Experiment 3). This experiment investigated the possible impact of varying plausibility on source credibility using narratives with plausibility-manipulated endings while having a low-credibility narrator in all conditions. Additionally, a high-credible source within the story gave affirming or contradicting information on the narrator's perspective. Participants judged plausible story endings as significantly more plausible compared to implausible story endings. Notably, the plausible ending was judged as even

more believable when a high-credible source (i.e., the police) confirmed the events, thus plausibility was boosted by high-credible sources.

Moreover, a possible explanation for the different result pattern on spillover sentences between Foy et al. (2017) and our findings might be the degree of semantic overlap in the experimental texts. The texts used by Foy and colleagues consisted of a story continuation that affirmed or contradicted the plausible or implausible assertion, which induced high semantic overlap between the continuation and the assertion. Our experimental texts had less semantic overlap and thus might have caused a more delayed comprehension because the relevant background information (i.e., information about source credibility) needed more time to become activated and integrated. The higher semantic overlap in the stories of Foy et al. (2017) might have induced readers to require more integration of contextual information, as in verifying the assertion by accessing discourse knowledge, compared to our experiments in which readers could validate the assertions by accessing their world knowledge.

Different Dimensions of Source Credibility and Their Impact on Validation

Another difference between our experiments and the experiments by Foy et al. (2017) is the way that source credibility was manipulated. Source credibility is commonly conceptualized with the two dimensions of expertise and trustworthiness (Self, 2009). Foy and colleagues varied trustworthiness. For example, low-credible sources in their experimental texts were on drugs, paranoid, or had other severe impairments of perception. In our experiments, we varied expertise through descriptions of the source's occupations or education. Low-credible sources were described as persons with no knowledge about a specific topic, and high-credible sources were described as persons with very much knowledge about a specific topic or as experts in the specific topic (e.g., a university professor). Research on source credibility indicates that expertise and trustworthiness might elicit different effects on believability (see Pornpitakpan, 2004, for an overview), but findings are inconclusive. Nonetheless, these differences might play a role in explaining how source

credibility is used in validation. One possibility is that varying a source's expertise might be a less explicit manipulation than varying a person's trustworthiness by describing their general mental state as was done by Foy et al. (2017). However, the strong main effect of source credibility in the source-credibility ratings suggest that the expertise manipulation was effective.

Validation and Source Information from the Perspective of the D-ISC assumption

The D-ISC assumption (Braasch et al., 2012) states that readers are more likely to focus on source information when confronted with inconsistent information. As the findings by Braasch et al. (2012) and associated research (e.g., de Pereyra et al., 2014; Rouet et al., 2016; Saux et al., 2018) indicate, one way for readers to resolve the inconsistencies is to revisit the passage of the text with the source information or to provide more resources when initially processing the source information. In Experiment 2, we could not explore this possibility because the self-paced reading paradigm used in our experiments prevented readers from returning to previously read sentences. Even though comprehension is only marginally impaired by a self-paced reading paradigm with linear reading (Chung-Fat-Yim et al., 2017), using other more naturalistic paradigms such as eye-tracking, which allow readers to regress to earlier sentences, would be fruitful for future research. In line with the D-ISC assumption (Braasch et al., 2012), we expect that readers who are confronted with inconsistencies, (e.g., a high-expertise source providing a false statement) would revisit the sentences that conveyed the source information in an attempt to reconcile the inconsistency.

An exploratory finding of Experiment 1 that might be relevant for the D-ISC assumption and related research is that the results suggest a more dynamic relationship between source credibility and plausibility than commonly assumed. Source credibility influenced perceived plausibility, but plausibility also influenced the perceived source credibility. Further research could focus more on this exploratory finding and attempt to

disentangle the dynamic relationship of plausibility and source credibility.

Further Limitations and Directions for Future Research

Future research should also provide participants with a clear definition of plausibility to assure participants have the same concept of plausibility in mind. Given the narrative context of the experimental stories and the possible story world that this context could induce, readers could have assessed plausibility differently than with other types of texts. Another limitation of our experiments might be the length and the repetitive character of the study. Reading 36 or even 48 stories consecutively might cause familiarity effects or even induce strategic processing. Some indication of position effects were found in the meaningfulness and comprehensibility ratings in Experiment 1 (which slightly decreased over the course of the experiment) and in the reading times in Experiment 2 (which also slightly decreased over the course of the experiment). Importantly, however, additional analyses (not reported here) revealed no indication that the hypothesized effects were moderated by the position of a story in the experiment.

Conclusion

In conclusion, the present experiments provide further evidence for validation as a mechanism to maintain a coherent situation model. Our findings expand the emerging body of evidence from studies investigating possible conditions that influence validation, that is, the competition of contextual information and world knowledge and their impact on the component processes of comprehension as outlined in the RI-Val model (O'Brien & Cook, 2016a, 2016b). Apparently, source credibility can affect the validation of text information. Further research should map out the conditions that shape the interaction of plausibility and source information.

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5   Study 2: The Role of Source Credibility in the Validation of Information Depends on the Degree of (Im-)Plausibility

Abstract

This study examined the role of source credibility in the validation of factual information embedded in short narratives. In a self-paced reading experiment, we tested the assumption that the degree of (im-)plausibility determines the extent that source credibility affects validation during comprehension. We used reading times of target and spillover sentences and plausibility judgments as indicators of validation. Participants read stories with a high- vs. low-credible person (expert vs. non-expert) who made plausible, somewhat implausible, or highly implausible assertions. Reading times increased and plausibility judgments varied as a function of knowledge consistency, decreasing from knowledge-consistent to implausible to knowledge-inconsistent items. Moreover, interactions of source credibility and plausibility were found for reading times of spillover sentences and plausibility judgments, indicating that source credibility and plausibility are jointly considered in validation. High-credible sources mitigated the perceived implausibility of somewhat implausible sentences but exacerbated the perceived implausibility of highly implausible information. A corresponding interactive pattern was found for the reading times of the spillover sentences. Thus, implicit and explicit indicators provided converging evidence that the modulating role of source credibility in validation depends on the degree of implausibility.

Keywords: Validation, Plausibility, Sourcing, Credibility, Text Comprehension

A growing body of research has shown that text comprehension entails the validation of text information, that is, (implicit) judgments of its truth or falsity—as an integral component of situation model construction and updating (e.g., Cook & O'Brien, 2014; O'Brien & Cook, 2016a, 2016b; Richter et al., 2009; Singer, 2013). Yet, a dearth of research exists on conditions that affect validation. One active area of research is concerned with how world knowledge and contextual information are used in validation (e.g., Isberner & Richter, 2014; van Moort et al., 2018, 2021; Walsh et al., 2018; Williams et al., 2018). Source credibility is a particular type of contextual information that bears a strong conceptual relationship to the validity of information and might thus be especially relevant for validation. In particular, information on the credibility of a source might be used by the reader to decide whether the information provided by the source is believable or not. Recent research indicates an interactive relationship of source credibility and the plausibility of information. The bottom line of this research is that validation seems to rely primarily on the fit between text information and the world knowledge that readers activate during comprehension, but source credibility can exert an additional modulating influence (e.g., Braasch et al., 2012; Foy et al., 2017; Wertgen & Richter, 2020). Nevertheless, the underlying cognitive mechanisms are still unclear because the interactive patterns differ across experiments. A key to a better theoretical understanding of how exactly source information is used in validation might be to investigate the degree of (im-)plausibility of text information. In other words, the size and the direction of the modulating effect of source credibility might depend on the extent ton which the information is (im-)plausible. To test this assumption, we manipulated plausibility gradually by extending the experimental design used by Wertgen and Richter (2020) with an additional intermediate level of plausibility between plausible (world-knowledge consistent) and highly implausible (world-knowledge inconsistent) information.

In the following review, we will briefly discuss research on validation during comprehension and review studies that have examined the role of source credibility in text

comprehension. We will then discuss the small body of studies that have examined combined effects of plausibility and source credibility. The discussion of this research will provide the background to justify the focal assumption that the role of source credibility in validation depends on the degree of (im-)plausibility.

Validation as Implicit Assessment of Plausibility

A considerable body of research indicates that readers use their world knowledge and contextual information to routinely evaluate the plausibility of text information, a process that has been coined *validation* (O'Brien & Cook, 2016a; 2016b; Richter, 2015; Singer, 2013; 2019). In this context, plausibility can be defined as the "acceptability or likelihood of a situation or a sentence describing it" (Matsuki et al., 2011, p. 926). Experiments with reaction times based on the epistemic Stroop paradigm in which false, belief-inconsistent, or implausible statements slow down affirmative responses in an unrelated task provide strong evidence for routine validation with various types of linguistic and audio-visual stimuli (e.g., Gilead et al., 2019; Isberner & Richter, 2013, 2014; Piest et al., 2018; Richter et al., 2009). Further corroborating evidence for routine validation as an integral part of text comprehension stems from experiments based on a wide range of methods such as eye tracking (e.g., Matsuki et al., 2011), event-related potential data (e.g., Ferretti et al., 2008), and reading times (e.g., Cook & O'Brien, 2014; for an overview, see Isberner & Richter, 2014). For example, a typical finding from reading-time experiments based on the so-called inconsistency paradigm is a slowdown for target sentences that are inconsistent with information provided earlier in the text (e.g., O'Brien et al., 1998) or that are inconsistent with world knowledge (e.g., Rapp, 2008).

The Resonance-Integration-Validation Model (RI-Val) proposed by O'Brien and Cook (2016a, 2016b) contains the assumption that resonance (activation), integration, and validation of information are three passive processes that, once started, run to completion. Text information provides cues that activate knowledge in a resonance-like process (*R*; Myers

& O'Brien, 1998; O'Brien & Myers, 1999). This information is linked with content in active memory (*I*) based on conceptual overlap. These linkages are then validated against information in active memory (*Val*). Once a certain degree of coherence is matched, the reader continues reading. All three processes, resonance, integration, and validation can influence comprehension. The RI-Val Model also contains the temporal assumption that resonance, integration, and validation overlap but start successively (in a cascade-like style). Depending on readers' coherence threshold, which may vary according to their standards of coherence (van den Broek et al., 1995, 2011), validation may run to completion after the reader has moved on in the text. If that is the case, validation effects may not occur during reading the sentence whose contents are validated but during reading subsequent sentences. Actually, in reading time studies based on the inconsistency paradigm, information that is inconsistent with previous text or world knowledge slows down reading not so much on the implausible sentence but on the subsequent ("spillover") sentence (Cook & O'Brien, 2014; O'Brien & Cook, 2016a, 2016b).

Evaluation of Source Credibility

Research on source credibility usually focuses on expertise or trustworthiness as the two major dimensions of source credibility (Lombardi et al., 2014; Self, 2009). In the present research, we focused on the expertise dimension, which refers to "the extent to which a speaker is received to be capable of making correct assertions" (Pornpitakpan, 2004, p. 244). The effects of source credibility have mainly been investigated in multiple text comprehension. In multiple text reading situations, readers must integrate information from multiple texts from different perspectives on a specific topic (e.g., scientific texts about vaccines). Ideally, readers build a mental representation that includes an integrated mental model and an intertext model of the texts (Perfetti et al., 1999). The intertext model represents source characteristics of texts (e.g., text type, author, language style) and the argumentative relationship between documents (e.g., "Text A supports Text B; opposes Text C"). Thus,

source features and evaluations of source credibility based on these features can help readers make sense of multiple texts with conflicting information. Extant research shows that engaging more in processing source features, such as evaluating texts for trustworthiness based on source information, may improve multiple text comprehension (e.g., Bråten et al., 2009; Goldman et al., 2012; Wiley et al., 2009; Wineburg, 1991).

Evidence for an Interplay of Plausibility and Source Information during Comprehension

To our knowledge, only few studies have investigated the combined effects of source credibility and plausibility on validation and comprehension. The Discrepancy-Induced Source Comprehension (D-ISC) Model assumes that when readers encounter discrepant (i.e., inconsistent) text information, they shift their attentional resources to sources and their characteristics, possibly in an attempt to resolve the discrepancy. Preliminary evidence for this assumption stems from the experiments by Braasch et al. (2012) and other research associated with the D-ISC model (for an overview see Braasch & Bråten, 2017). Readers showed better memory for discrepant text versions, fixated on source information more, and spent more time on source information. Although the D-ISC assumption holds that the detection of inconsistencies, which may be construed as the outcome of validation processes, intensifies sourcing during moment-by-moment processing, it does not specify how source information, in turn, affects the validation of text information. To our knowledge, Foy et al. (2017) conducted the first study to examine this question by investigating in reading time experiments with short narratives how trustworthy or untrustworthy sources affect the validation of implausible (e.g., seeing wolves in the backyard at a party) and plausible (e.g., seeing that it rains outside at a party) assertions. Participants were not able to determine the truth status of these assertions as they referred to events in the story world. However, the assertions were implausible (the described events unlikely) or plausible (the described events likely) according to general world knowledge. Foy et al. found that implausible assertions

were read faster when they came from trustworthy sources. However, there was no effect of source credibility on plausible assertions. Their experiments show that plausibility and source credibility each affect validation with stronger effects exerted by plausibility. Wertgen and Richter (2020) followed a similar approach by collecting reading times and explicit plausibility judgments to examine joint effects of plausibility and source credibility (high vs. low-expertise sources) on validation. Unlike Foy et al., however, Wertgen and Richter used target sentences that were clearly consistent (e.g., Jupiter is the biggest planet in the Solar System) or inconsistent (e.g., The sun is the biggest planet in the Solar System) with general world knowledge and could thus be accepted or rejected based on activated knowledge. They found that credible sources slowed down the reading of world-knowledge inconsistent sentences and lowered their plausibility of world-knowledge inconsistent sentences. A possible explanation for the divergent effects of source credibility in the experiments by Foy et al. and Wertgen and Richter might lie in the degree of implausibility of information. This idea is elaborated in the following section.

The Role of Source Credibility Possibly Depends on the Degree of (Im-)Plausibility

We start from the general assumption that source credibility as contextual information and plausibility are jointly considered in validation processes. However, world knowledge dominates the validation process in most cases, whereas source credibility only modulates it, and the direction of these modulatory effects depends on the degree of implausibility. Social judgment theory (e.g., Sherif et al., 1965; Sherif & Sherif, 1967) provides a framework to conceptualize the differential effects of source credibility depending on the degree of (im-)plausibility. According to social judgment theory, judgments of belief-relevant information occur on a continuum with latitudes of acceptance, rejection and noncommitment. Plausibility varies along such a continuum (Isberner & Richter, 2014). Analogous to the notion of latitudes of acceptance, rejection, and noncommitment in social judgment theory, we assume that the influence of source credibility depends on the degree of

(im-)plausibility. When an assertion in a text is clearly consistent with accessible world knowledge, this knowledge should dominate validation, and the influence of source credibility should be minimized (comparable to the latitude of acceptance). With decreasing plausibility, the impact of source credibility should increase. Thus, source credibility should mitigate the implausibility of text information that readers cannot clearly reject or accept (comparable to the latitude of noncommitment) but only until a certain degree of implausibility is reached. If the information is clearly false (i.e., highly implausible), the effect of source credibility flips. In that case, a high-credible source creates a mismatch between source credibility and the false information, increasing the disruptive effect of the inconsistency during comprehension.

Rationale of the Present Experiment

The present research tested the assumption whether the degree of (im-)plausibility affects how source credibility is considered in validation during comprehension. To this end, we extended the experimental design used by Wertgen and Richter (2020) by adding a level of plausibility that is between extreme points of plausibility. We used sentences that were highly plausible (world-knowledge consistent), somewhat implausible and highly implausible (clearly world-knowledge inconsistent). These sentences were embedded in short stories and stated by a person described as a source with a high or low level of expertise. This method made it possible to investigate the relationship between plausibility and source credibility for validation as a continuum. We included online measures (reading times) and explicit measures (plausibility judgments) to investigate possible convergences and divergences in moment-to-moment processes during reading and more global judgments after reading (Rapp & Mensink, 2011).

For target sentences, we expected readers to process plausible sentences faster than sentences that are somewhat implausible or highly implausible. Additionally, we expected readers to process somewhat implausible sentences faster than highly implausible sentences

(Hypothesis 1a). More importantly, we expected source credibility and plausibility to interact (Hypothesis 2a). Somewhat implausible sentences by high-expertise sources should lead to faster reading times compared with low-expertise sources. With increasing implausibility, we expected the pattern to flip, that is, longer reading times for highly implausible sentences asserted by a high-expertise source compared with low expertise sources. Reading times of plausible sentences should be unaffected by source credibility. Thus, we expected world knowledge to dominate validation in assertions that were close to the endpoints of the plausibility continuum and source information to exert an effect in assertions that readers cannot clearly reject or accept.

In line with the temporal assumptions of the RI-Val model (O'Brien & Cook, 2016a, 2016b), the expected effects on target sentences should also be revealed and might even be more pronounced on the subsequent (i.e., spillover) sentences. Thus, we expected reading times of spillover sentences to increase with decreasing plausibility (Hypothesis 1b). We also expected plausibility and source credibility to interact, with longer reading times for a high-expertise vs. a low-expertise source in highly implausible sentences and the reverse pattern in somewhat implausible sentences (Hypothesis 2b).

For plausibility ratings, we expected a decline in plausibility ratings from plausible sentences to somewhat implausible sentences to highly implausible sentences (Hypothesis 1c), mirroring the Hypotheses 1a and 1b. Moreover, we expected plausibility and source credibility to interact on plausibility ratings. For highly implausible sentences, a low-expertise source should lead to higher plausibility ratings than a high-expertise source, whereas the opposite pattern should occur for somewhat implausible sentences (Hypothesis 3).

Method

Participants

Ninety-nine participants with an average age of 24.40 years (*SD* = 8.14 years) participated in the experiment. Most participants were female (80%) and university students

(89%). On average, the university students had completed 2.93 semesters ($SD = 2.66$). The data from six participants who spoke a first language other than German were excluded from the analyses. Thirty-two participants received study credit and 67 participants received a monetary compensation (11 Euros).

Material

The experimental materials were 36 eight-sentence short stories (number of words: $M = 100.66$, $SD = 12.75$) that were based on the materials developed by Wertgen and Richter (2020) and extended by eight newly developed stories. The stories described everyday situations (e.g., vacations, restaurant visits). The third sentence described the protagonist either as a source with high or low credibility (person with high vs. low expertise in a certain field, e.g., a physics professor vs. a hairdresser apprentice making a statement about theory of relativity). The sixth (target) sentence was an assertion made by the protagonist in direct speech. This assertion was plausible (i.e., consistent with world knowledge), somewhat implausible, or highly implausible (see Table 5.1 for an example story) and matched the field of expertise mentioned in the description of the protagonist. The three categories of assertions in the target sentences were based on the general knowledge norms reported by Nelson and Narens (1980). Tauber et al. (2013) updated these norms and presented a table with the most frequent false responses. Based on this table, materials in the somewhat implausible condition corresponded to inaccurate statements that were provided by 6 to 65% of respondents as answers to knowledge questions with constructed responses.

The experimental stories had an average Flesch score (Flesch, 1948, German adaptation by Amstad, 1978) of 56.46 ($SD = 5.84$) which translates to "demanding" or "fairly difficult" to read. Moreover, 36 plausible filler stories were used (20 adapted and translated from Foy et al., 2017). The filler stories were eight sentences long and were linguistically similar to and covered topics comparable to the experimental stories. However, the filler stories contained no cues to the protagonist's expertise and no direct speech.

Table 5.1

Sample Experimental Story

Introduction:
Today was Aaron's big day: he was a candidate on the TV show 'Who wants to be a millionaire?'. It was his first time on live television.
Expertise
    Low expertise:
    Aaron did not have a lot of general knowledge and he was only on the show because his friends had applied in his name and against his will.

    High expertise:
    Aaron was very knowledgeable in various domains; as such, he liked to watch as much quiz shows as possible.
Continuation:
All his friends were in the audience. The show host was about to read the possible answers to his question as Aaron interrupted him.
Assertion
    Plausible assertion: 'I know the answer without having to choose from the possible answers, watt is the measurement of electric power,' Aaron said confident of victory.
    Somewhat implausible assertion: 'I know the answer without having to choose from the possible answers: ampere is the measurement of electric power,' Aaron said confident of victory.
    Highly implausible assertion: 'I know the answer without having to choose from the possible answers: kilogram is the measurement of electric power,' Aaron said confident of victory.
Spillover: Before the right answer was revealed, the TV station decided, it was time for a commercial break.
Ending: Aaron couldn't stand the tension.

Norming Study

A norming study was conducted with the experimental texts to confirm that the story versions differed in perceived credibility between the two sources and in perceived plausibility between the degrees of plausibility. The 48 participants were mostly female (88%) and undergraduates from the University of Würzburg. The average age was 23.38 years ($SD = 6.27$ years). They were compensated with 5 Euros. Participants read the 36 stories in a randomized order and rated the plausibility of the assertions (1 = "very implausible" to 7 =

"very plausible") and the credibility of the source (1 = "not credible at all" to 7 = "very

credible") with respect to the field of expertise associated with the assertion. Presentation of

story versions and the order of the two rating tasks were counterbalanced across participants.

High-expertise sources received higher source credibility ratings (M = 4.50, SE = 0.12) than

low-expertise sources (M = 3.12, SE = 0.12), β = 0.69, $t(1641)$ = 15.43, $p < .001$, d = 0.70.

For plausibility ratings, we found the expected monotonic decline from plausible over

somewhat implausible to highly implausible assertions. Plausible assertions (M = 5.23, SE =

0.11) were judged as more plausible as somewhat implausible assertions (M = 3.76, SE =

0.11), $t(1634)$ = 13.61, $p < .001$, d = 0.77, and somewhat implausible assertions were judged

as more plausible compared with highly implausible assertions (M = 2.47, SE = 0.11), $t(1636)$

= 11.98, $p < .001$, d = 0.68. These findings suggest that the manipulation of plausibility and

source credibility was successful.

Design

The design was a 2 (source credibility: high expertise vs. low expertise) x 3

(plausibility: plausible vs. somewhat implausible vs. highly implausible) within-subjects

design. Each participant read one version of every story. The assignment of stories to

experimental conditions across participants was counterbalanced across participants.

Participants read the stories in random order.

Procedure

For the most part, the procedure was identical to Wertgen and Richter (2020). The

experiment took place on two appointments in order to mitigate fatigue and order effects,

which were 4.22 (SD = 3.83) days apart on average. Participants read all 72 stories

(experimental stories plus filler stories) on a computer screen in a self-paced fashion (sentence

by sentence) at the first appointment. Participants were instructed to read the stories for

comprehension and to answer questions about the story after some of the stories. A fixation

cross was displayed at the location of the first word for 500 ms. Participants could advance to

the next sentence by pressing a key. Practice trials were included at the beginning to familiarize participants with the self-paced reading method. Letters in all sentences except the currently read one were masked with an 'x'. After every filler story, participants responded to a yes/no comprehension question. At the second appointment, participants were given a definition of plausibility ("Plausibility describes how likely we think it is that an assertion is true or that the described situation actually took place") and instructed to read the stories again in a self-paced fashion. Participants were asked to judge the plausibility of the target sentence on a scale from 1 (*not plausible at all*) to 7 (*very plausible*). Subsequently, participants judged for each assertion whether the assertion is true or false and their confidence in their decision on a scale from 1 (*not confident at all*) to 7 (*very confident*). This measure was included as a manipulation check for the plausibility manipulation and will be referred to as general knowledge test. The experiment lasted 64.87 min (*SD* = 21.57) on average.

Results

Reading times and plausibility ratings were analyzed with linear mixed models with random effects (random intercepts) of participants and stories (Baayen et al., 2008). The models were estimated with the lmer function of the R package lme4 version 1.1.-23 (Bates et al., 2015). The emmeans function in the lsmeans package (Lenth, 2016) was used for follow-up tests and to derive model-based estimates of condition means and the associated standard errors. The Type-I-Error probability was set at .05 (two-tailed) in all significance tests. All factors were effect-coded, and their main effects and the interaction were entered as fixed effects in the model. Sources with high credibility (high expertise) were coded as 1, and sources with low credibility (low expertise) were coded as -1. For plausibility, two effect-coded contrasts were constructed. In the first contrast, plausible assertions were coded as 1, highly implausible assertions were coded as -1, and somewhat implausible assertions were coded as 0. In the second contrast, plausible assertions were coded as 1, somewhat

implausible assertions were coded as -1, and highly implausible assertions were coded as 0. For analyses of reading times, sentence length and the position of the story in the experiment were entered in the model as centred predictors (fixed effects). One story version was excluded from all analyses because of a programming error (15 data points overall). In the reading times, we examined processing effects on a millisecond level. Therefore, data from six nonnative speakers and three participants with low performance on comprehension questions (less than 80% correct) were excluded (276 data points, or 8.3% of data of target and spillover sentences) from reading times analyses because reading times were higher on average compared to native speakers and participants with satisfying performance on comprehension questions. Reading times lower than 500ms per sentence were excluded from the analysis (6 data points, or 0.2% of data for target sentences; 8 data points, or 0.2% of data for spillover sentences). Distributions of reading times normally have a positive skewness with extreme outliers in the right tail of the distribution (e.g., Ratcliff, 1993). To account for this characteristic while not excluding too much data, we excluded reading times that deviated more than 2 *SD* from the participant mean or the item mean from the analysis (247 data points, or 7.4% of data for target sentences; 217 data points, or 6.5% of data for spillover sentences). After data trimming, reading times were only moderately skewed (0.87 for target sentences, 0.81 for spillover sentences). The final sample for the reading time analysis consisted of 90 participants with a mean accuracy of 91.62% ($SD = 4.91\%$) on the comprehension questions. See Table A1 for descriptive statistics of all dependent variables.

A separate analysis of plausibility judgments without data from nonnative participants and from participants with a low performance on comprehension questions (parallel to the exclusion criteria for the reading time data) elicited no substantial differences in results. Thus, we excluded no data for the analysis of plausibility judgments.

We estimated linear mixed models with all predictors (full model) and compared them to reduced models to test the fixed effects of the main effect of plausibility and the interaction

effect. These tests were based on differences in deviances (which follow a χ^2 distribution) between the models for target and spillover sentences and for plausibility ratings.

Moreover, we estimated effect sizes (Cohen's *d*) for differences in condition means based on the approximate formula proposed by Westfall et al. (2014) for linear mixed models with contrast-coding and one degree-of-freedom tests (see also Judd et al., 2017). We also conducted a post-hoc sensitivity analysis of the effects based on the method proposed by Westfall et al. (2014), as implemented in the accompanying web-based app (https://jakewestfall.shinyapps.io/crossedpower/). For the sensitivity analysis, we used the smallest effect size found (*d* = -0.10) and the corresponding variance components of the random effect of participants (0.37), the random effect of stories (0.08) and the residual variance (0.55) taken from the corresponding linear mixed model. All other variance components were assumed to be 0 since the random intercept of participants and stories were the only random effects in the model. With our sample size of 90 participants and 36 stories, we estimated a post-hoc sensitivity (1-β) of .99.

Reading Time for Target Sentences

Table 5.2 provides estimates and significance tests of the fixed effects in the model for the reading time of target sentences. The sentence length and the position of the story in the experiment had a significant effect on reading times. Longer target sentences led to longer reading times. More time was needed to read target sentences presented in stories appearing earlier in the course of the experiment.

According to our prediction stated in Hypothesis 1a, we found a strong main effect of plausibility, $\chi^2(2) = 56.34$, *p* < .001. Participants read plausible sentences (*M* = 3811 ms, *SE* = 113 ms) faster than somewhat implausible sentences (*M* = 4020 ms, *SE* = 113 ms), *t*(2670) = -4.37. *p* = < .001, *d* = -0.15. They also read somewhat implausible sentences faster than highly implausible sentences, *t*(2684) = -3.14, *p* = .002, *d* = -0.11. However, no interaction effect of plausibility and source credibility emerged, $\chi^2(2) = 1.06$, *p* = .589 (Figure 5.1). Thus,

Hypothesis 2a was not supported. Instead, the lack of evidence for an influence of source credibility on the reading times for the target sentence suggests a dominating role of world knowledge for initial validation processes.
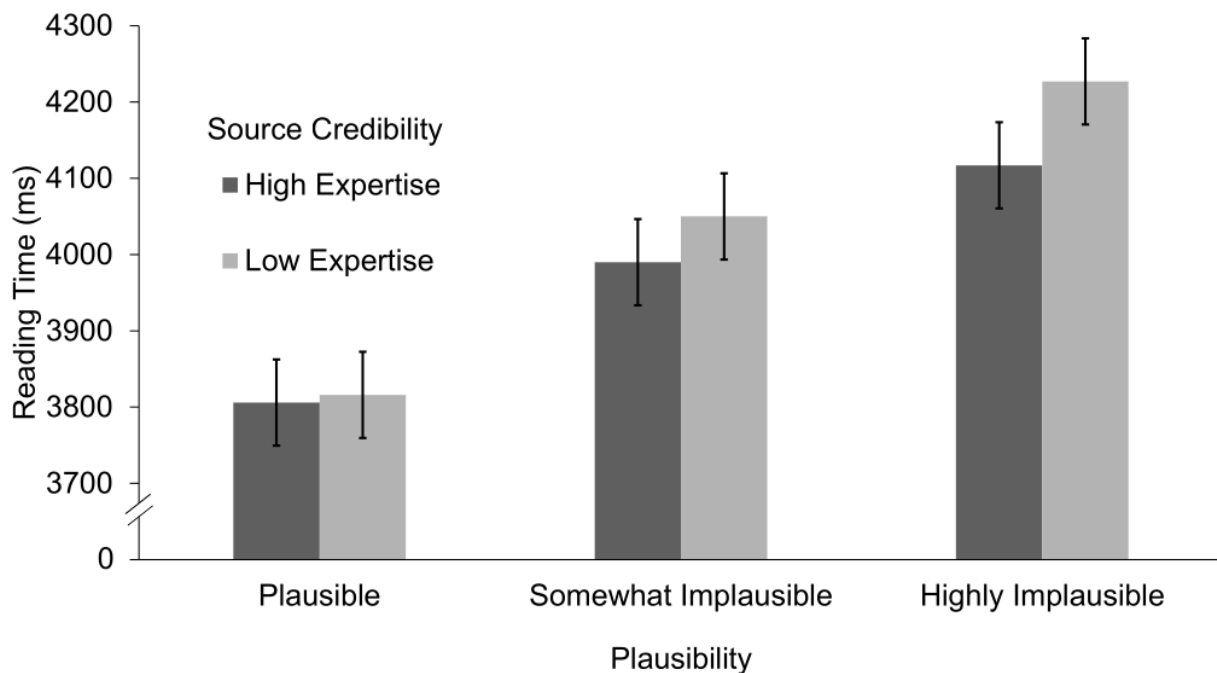
Table 5.2

Estimated Coefficients, Standard Errors, Degrees of Freedom, and t Values for the Linear Mixed Model of the Reading Times of the Target Sentence.

	Est.	*SE*	*df*	*t*	*p*
(Intercept)	4001.89	103.49	106.37	38.66	< .001
Length of Sentence	726.44	47.59	88.13	15.27	< .001
Position	-238.40	20.19	2673.15	-11.81	< .001
Source Credibility	-30.01	19.60	2648.27	-1.53	.126
Plausibility Contrast 1	-171.32	28.05	2667.80	-6.11	< .001
Plausibility Contrast 2	-18.66	27.80	2672.73	-0.67	.502
Source Credibility x Contrast 1	24.77	28.00	2652.21	0.89	.376
Source Credibility x Contrast 2	0.00	27.66	2649.42	0.00	1.00

Note. Source Credibility (contrast coded: high expertise = 1, low expertise = -1). Plausibility (effect coded: contrast 1: plausible = 1, somewhat implausible = 0, highly implausible = -1; contrast 2: plausible = 1, somewhat implausible = -1, highly implausible = 0).

Figure 5.1

Mean reading times (with standard errors) on target sentences by experimental condition

Reading Time for Spillover Sentences

Table 5.3 provides estimates and significance tests of the fixed effect in the model for reading times of the spillover sentences. We found significant main effects of sentence length and item position. Longer spillover sentences led to longer reading times. Stories presented later in the experiment led to faster reading times.

As expected in Hypothesis 1b, the analysis revealed again a main effect of plausibility, $\chi^2(2) = 12.76$, $p = .002$. Sentences subsequent to plausible target sentences ($M = 2613$ ms, $SE = 68.40$ ms) were read significantly faster than sentences subsequent to highly implausible target sentences ($M = 2715$ ms, $SE = 68.50$ ms), $t(2675) = -3.56$, $p < .001$, $d = -0.12$. However, no significant difference was found between sentences subsequent to a plausible target sentence and sentences subsequent to a somewhat implausible target sentence, $t(2677) = -1.56$, $p = .120$.

The main effect was qualified by an interaction effect of source credibility and plausibility, $\chi^2(2) = 10.09$, $p = .006$. The pattern of the interaction is displayed in Figure 5.2.

A somewhat implausible spillover sentence was read faster when it was combined with a high-expertise source ($M = 2614$, $SE = 71.30$) compared to a low-expertise source ($M = 2701$, $SE = 71.40$), $t(2675) = -2.14$, $p = .033$, $d = -0.10$. This pattern flipped on highly implausible sentences. That is, high-expertise sources lead to longer reading times in spillover sentences subsequent to highly implausible sentences ($M = 2763$, $SE = 71.20$) compared with low-expertise sources ($M = 2667$, $SE = 71.70$), $t(2676) = 2.35$, $p = .019$, $d = 0.11$. Thus, Hypothesis 2b, regarding the modulating role of source credibility for the validation of somewhat implausible and highly implausible information, was supported.
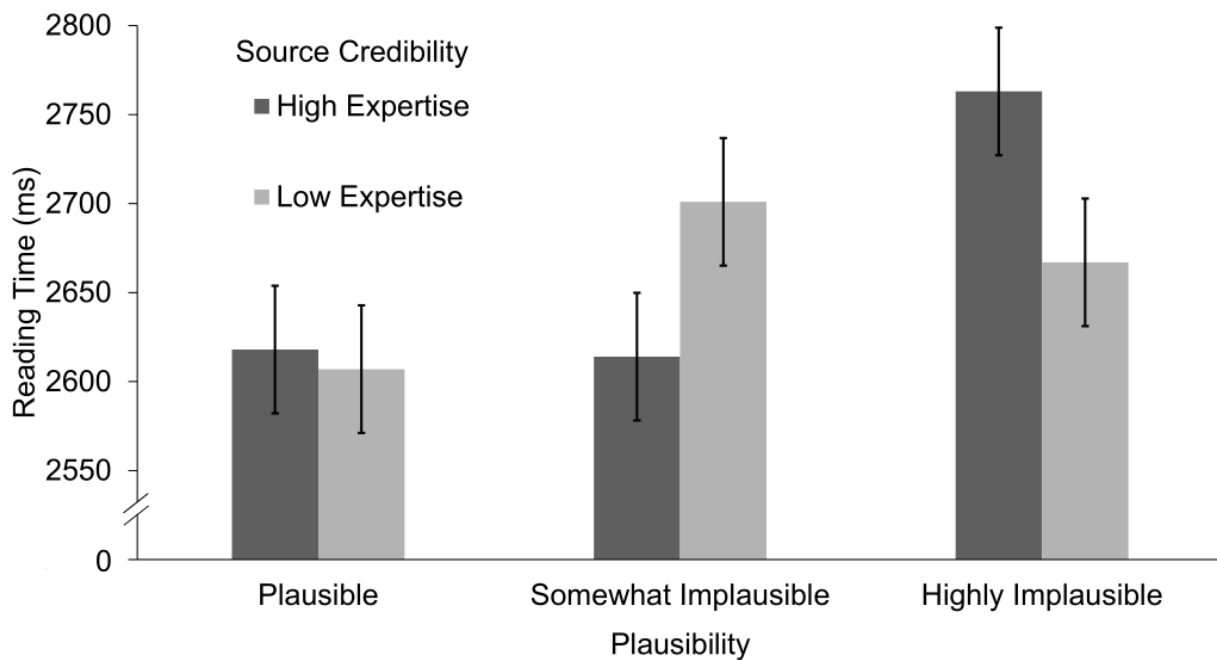
Table 5.3

Estimated Coefficients, Standard Errors, Degrees of Freedom, and t Values for the Linear Mixed Model of the Reading Times of the Spillover Sentence.

	Est.	*SE*	*df*	*t*	*p*
(Intercept)	2661.62	66.40	111.59	40.09	< .001
Length of Sentence	476.51	38.85	36.00	12.26	< .001
Position	-139.32	12.03	2691.93	-11.58	< .001
Source Credibility	3.46	11.72	2673.15	0.30	.768
Plausibility Contrast 1	-53.36	16.60	2673.87	-3.22	.001
Plausibility Contrast 2	4.41	16.55	2676.52	0.27	.80
Source Credibility x Contrast 1	-44.48	16.64	2674.56	-2.67	.008
Source Credibility x Contrast 2	46.79	16.57	2673.61	2.82	.005

Note. Source Credibility (contrast coded: high expertise = 1, low expertise = -1). Plausibility (effect coded: contrast 1: plausible = 1, somewhat implausible = 0, highly implausible = -1; contrast 2: plausible = 1, somewhat implausible = -1, highly implausible = 0).

Figure 5.2

Mean reading times (with standard errors) on spillover sentences by experimental condition

Plausibility Ratings

Table 5.4 provides estimates and significance tests of the fixed effects for the plausibility ratings. Plausibility ratings were available from 99 participants. Models that controlled for item position and the difference in days between the two appointments as centred metric predictors did not elicit substantial differences in results. Therefore, these two control variables were not included in the analyses.

As predicted in Hypothesis 1c, we found a strong main effect of plausibility, $\chi^2(2) = 1778.70$, $p < .001$. As expected, perceived plausibility declined from plausible ($M = 5.58$, $SE = 0.08$) to somewhat implausible assertions ($M = 3.62$, $SE = 0.08$), $t(3411.60) = 27.45$, $p < .001$, $d = 1.08$, and from somewhat implausible to highly implausible assertions ($M = 2.13$, $SE = 0.08$), $t(34113.38) = 20.74$, $p < .001$, $d = 0.82$. Moreover, there was a significant interaction effect, $\chi^2(2) = 25.10$, $p < .001$ (Figure 5.3). In line with Hypothesis 3, a plausible statement by a high-expertise source ($M = 5.75$, $SE = 0.10$) was judged as more plausible than the same statement coming from a low-expertise source ($M = 5.40$, $SE = 0.10$), $t(3413) = 3.51$. $p =$

.006, $d = 0.20$. In contrast, a high-expertise source making a highly implausible assertion ($M =$

1.96, $SE = 0.10$) lowered the plausibility compared with a low-expertise source ($M = 2.30$, SE

$= 0.10$), $t(3417) = -3.39$. $p = .009$, $d = -0.19$. However, Hypothesis 3 was not completely

supported because there was no significant difference between somewhat implausible

assertions by a high-expertise source ($M = 3.69$, $SE = 0.10$) compared with a low-expertise

source ($M = 3.54$, $SE = 0.10$), $t(3413) = 1.53$. $p = .646$.

In sum, the findings for plausibility ratings show again that world knowledge is the

primary source for validation, but source credibility can affect validation as well.

Unexpectedly, we found no effect of source credibility on somewhat implausible sentences.

Readers apparently neglected source information in the explicit judgments of somewhat

implausible sentences.

Table 5.4

Estimated Coefficients, Standard Errors, Degrees of Freedom, and t Values for the Linear

Mixed Model of the Plausibility Ratings

	Est.	*SE*	*df*	*t*	*p*
(Intercept)	3.77	0.07	62.51	54.23	< .001
Source Credibility	0.03	0.03	3413.92	0.94	.350
Plausibility Contrast 1	1.64	0.04	3414.54	39.70	< .001
Plausibility Contrast 2	0.16	0.04	3411.93	3.83	< .001
Source Credibility x Contrast 1	0.20	0.04	3415.51	4.82	< .001
Source Credibility x Contrast 2	-0.05	0.05	3414.26	-1.21	.228

Note. Source Credibility (contrast coded: high expertise = 1, low expertise = -1). Plausibility

(effect coded: contrast 1: plausible = 1, somewhat implausible = 0, highly implausible = -1;

contrast 2: plausible = 1, somewhat implausible = -1, highly implausible = 0).

Figure 5.3

Mean plausibility ratings (with standard errors) of the target sentence by experimental

condition
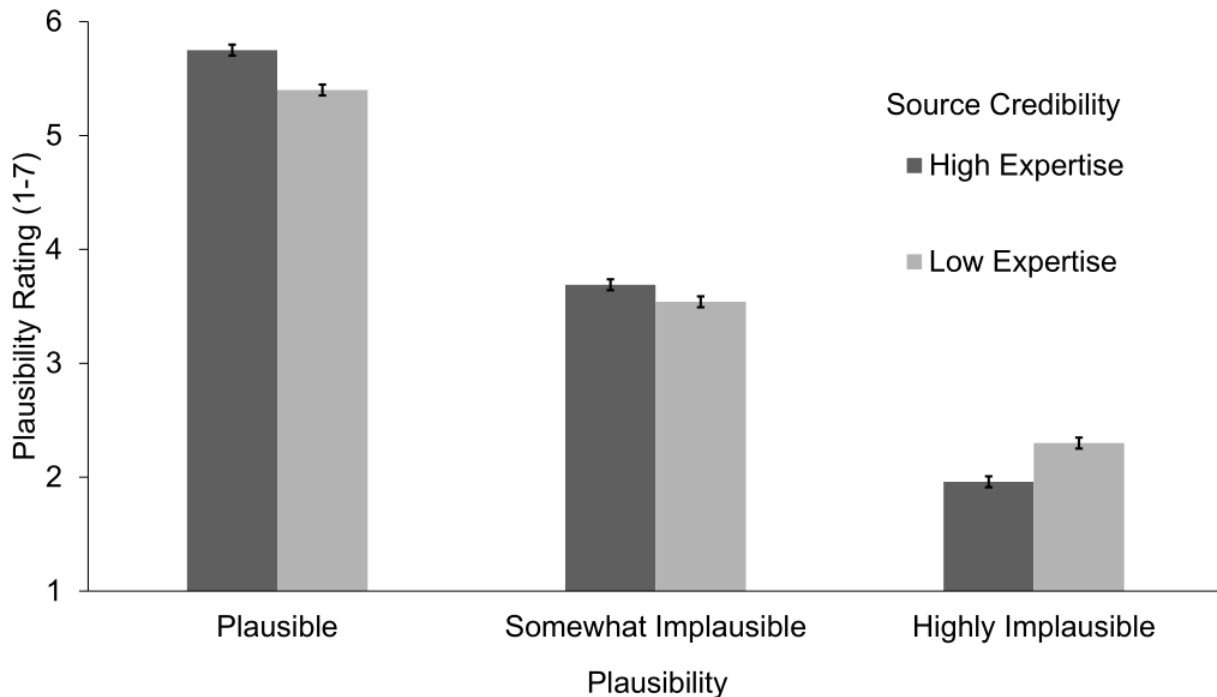
Accuracy and Confidence in the General Knowledge Test

Participants recognized false and correct world-knowledge facts with an average

accuracy of 81% (*SD* = 39%). The individual accuracy ranged from 58% to 97%. Nine

participants had an accuracy of less than 70%. Analyses that excluded these nine participants

did not substantially change the effects relevant for the hypotheses. Therefore, data from these

participants remained in the data file. Accuracies and confidence judgments differed between

plausibility levels. On average, accuracy for plausible facts was 87% (*SD* = 32%), 63% (*SD* =

48%) for somewhat implausible facts, and 94% (*SD* = 24%) for highly implausible facts. The

confidence judgments mirrored this pattern (plausible: *M* = 5.00, *SD* = 1.36; somewhat

implausible: *M* = 4.25, *SD* = 1.58; highly implausible: *M* = 5.35, *SD* = 1.22). This pattern of

results suggests that the manipulation of plausibility was successful, with high accuracy and

confidence for facts close to the endpoints of the plausibility continuum and only low

accuracy (slightly above chance level) and lower confidence for somewhat implausible facts.

Discussion

The present experiment tested the assumption that the degree of (im-)plausibility affects the extent that source credibility is considered in validation during comprehension. We used reading times of target and spillover sentences as an implicit online-measure of validation and plausibility ratings as an explicit offline-measure. Two major findings emerged. First, we found strong plausibility effects on reading times for target and spillover sentences and on the plausibility ratings (supporting Hypotheses 1a, 1b, and 1c). In line with numerous reading time studies based on the contradiction paradigm (e.g., Cook & Guéraud, 2014; see Cook & O'Brien, 2014, for an overview) and many other experiments on the role of plausibility in comprehension (e.g., Isberner & Richter, 2014), consistency with world-knowledge seems to have dominated validation, from the early phases of processing to explicit judgments of plausibility.

Second, in line with our main guiding assumption, we also found evidence for a modulating role of source credibility on implicit and explicit validation. We expected high-credible sources to increase the perceived plausibility of somewhat implausible text information whose veracity was difficult to determine based on participants' world knowledge but also to increase the perceived implausibility of highly implausible sentences whose falsity was easy to determine based on their world knowledge. No evidence was found for such an interaction of plausibility and source credibility on reading times for the target sentence (Hypothesis 2a). However, the expected pattern was found for the spillover sentences (Hypothesis 2b). The reading of somewhat implausible spillover sentences stated by a high-credible source was faster compared with the same sentences stated by a low-credible source. This effect flipped in spillover sentences subsequent to highly implausible sentences, which were read more slowly when the highly implausible assertions came from high-credible sources compared with low-credible sources. In sum, these results suggest that source credibility might not affect the immediate phases of processing a statement but that it takes

effect after a delay, even though the simple main effects indicate that the modulating effect of source information is rather small, compared to the strong main effect of plausibility.

The temporal pattern of the reading-time effects is interpretable in the light of general assumptions about the competition of world knowledge and contextual information for activation, integration, and validation. A growing consensus is that general world knowledge (knowledge-based validation) is the primary criterion for validation and therefore will dominate initial processing (e.g., Cook & Guéraud, 2005), but contextual information can also influence validation and comprehension (text-based validation). Note, however, that in some instances source information can be the primary criterion for assessing the plausibility or believability of information as evidence from studies on multiple text comprehension in novices vs. experts suggests (e.g., Rouet et al., 1997; Wineburg, 1991). A growing body of research sheds light on the relative importance of both types of information. For example, evidence from eye movements (van Moort et al., 2021) and neuroimaging (van Moort et al., 2020) indicates distinct time courses for knowledge-based and text-based validation. Among other findings, van Moort et al., (2021) found stronger disruptive effects of inconsistencies based on world knowledge compared to contextual contradictions. As such, the strong effect of plausibility on target sentences found in the present experiment might be interpreted as further evidence for the dominating role of world knowledge in the initial validation of information. The pattern of effects is also in line with the temporal assumptions of the RI-Val model by which validation overlaps with integration but starts and runs to completion later, possibly after readers have moved on to the next sentence (Cook & O'Brien, 2014; O'Brien & Cook, 2016a; 2016b).

The direction of the effect of source credibility on the spillover sentences also differed between somewhat implausible and highly implausible sentences (as predicted in Hypothesis 2b). In somewhat implausible sentences, source credibility is informative because validation cannot lead to a conclusive outcome based on world knowledge alone. Therefore, high-

credible sources can affect validation by mitigating the disruptive effect of implausible information during reading. Highly implausible sentences, in contrast, can be validated based only on world knowledge. In such sentences, a high-credible source is at odds with the outcome of the knowledge-based validation process, increasing to the disruption of the reading process. The differential effects of source credibility for somewhat implausible and highly implausible sentences can be explained by assuming that plausibility forms a continuum that is structured by latitudes of rejection, noncommitment and acceptance (as described in social judgment theory, Sherif et al., 1965; Sherif & Sherif, 1967). Based on a similar conception of plausibility as a continuum, Hinze et al. (2014, Experiment 2) have compared accurate statements, inaccurate but plausible statements, and inaccurate and implausible statements, and collected readers' cognitive responses to these statements via think-aloud data. They showed that readers were more skeptical and less likely to accept inaccurate statements that were implausible, as compared to inaccurate statements that were plausible. According to the theoretical framework that our study is based on, whether a piece of textual information falls in the latitudes of rejection, noncommitment, or acceptance, is determined initially by the world-knowledge-dominated process of validation. Source information is most informative in the "gray" area of noncommitment but provides no additional information when the outcome of the validation process falls within the latitude of acceptance. This theoretical perspective not only accommodates the pattern of effects found in the present study but also integrates the seemingly divergent findings by Foy et al. (2017) and Wertgen and Richter (2020).

Of note, we found an influence of source information on the processing of somewhat implausible or highly implausible information, but not in the processing of plausible information. This pattern is also consistent with the D-ISC assumption (e.g., Braasch et al., 2012) and associated research (e.g., de Pereyra et al., 2014; Rouet et al., 2016; Saux et al.,

2018), according to which attention to source information is triggered by inconsistent information.

Implicit validation processes are assumed to feed into explicit plausibility judgments (e.g., Schroeder et al., 2008). Therefore, the effect of high-credible sources on the moment-by-moment processing of somewhat implausible information should be mirrored in the explicit plausibility ratings. We found an interaction effect of source credibility and plausibility on explict plausibility ratings, which was in line with the predictions (Hypothesis 3). Participants judged plausible sentences as even more plausible coming from a high-credible source. In contrast, high-credible sources lowered the plausibility of highly implausible sentences compared with low-credible sources. However, no significant effect of source credibility was found on the perceived plausibility of somewhat implausible sentences, although the pattern matched the one predicted by Hypothesis 3 descriptively. It is difficult to explain why the reading times and the plausibility ratings diverge at this point. Generally speaking, plausibility ratings are global judgments and more strategic compared with measurements of moment-by-moment processing; they partly rest on different (and more variable) psychological processes. These features might account for differences found between online indicators of reading processes and offline indicators of reading outcomes (Rapp & Mensink, 2011). Moreover, it must be kept in mind that the simple main effects of source credibility in the spillover reading times of the somewhat implausible information were significant but rather small. Thus, the impact of source information on online validation processes might have been too weak to carry over to the explicit plausibility judgments. Further research that elucidates the processes and the kind of information involved in the plausibility judgments is needed to clarify this point.

The present experiment raises interesting questions regarding the relationships between source information, validation, and readers' tendency to pick up false information from (fictional) stories (i.e., misinformation effects; Marsh & Fazio, 2006; Rapp, 2008).

Although our study was not designed to study the influence of inaccurate information on readers' beliefs, we propose that validation may protect readers from misinformation effects. However, research shows that this protection is far from perfect (for overviews see Isberner & Richter, 2014; Singer, 2019), in part because readers do not always possess the required prior knowledge to tell accurate from inaccurate statements. Source information might be an additional cue that modulates the accuracy of validation and, hence, the likelihood of misinformation effects to occur. For instance, a high-credible source in a narrative might exacerbate misinformation effects compared with a low-credible source. Note, that this interpretation is mostly speculative at this point and that further research, based on longer narratives and including plausible inaccuracies, is needed.

The core processes of comprehension, activation, integration, and validation are closely intertwined and jointly influence the mental representation that is constructed during reading (e.g., the RI-Val model, O'Brien & Cook, 2016a, 2016b). For example, activation interacts with validation as only information that is currently active can be used in validation. In the present study, we designed the experimental stories in a way that the activation of source information was highly likely by placing the source information close to the critical information in the target sentence. Moreover, we described the source in a way that readers could easily infer whether the source had a high or low credibility. Future research might focus on the interplay of validation and activation and how variations in factors that affect the activation of source information might also affect whether, how, and when source information is used in the validation process.

The results of the present experiment are consistent and make sense theoretically, but they need to be interpreted with its limitations in mind. One limitation is that we used short narratives developed by the experimenter with a schematic structure to enhance experimental control, and participants were required to read numerous stories successively. We cannot determine whether this relatively artificial reading situation might have induced specific

strategies that altered the results. It would be worthwhile to replicate the basic finding of differential effects of source credibility for highly implausible and somewhat implausible sentences with various settings and task contexts. For instance, Sparks and Rapp (2011) and de Pereyra et al. (2014) found that source-focusing instructions impacted readers' attention to and memory for source information, respectively. Moreover, we used the paradigm of self-paced reading (moving window) which poses certain restrictions on the reader. For example, participants could not revisit previously read text. Although studies have shown that text comprehension is only marginally impaired by a self-paced reading paradigm with linear reading (e.g., Chung-Fat-Yim et al., 2017), using eye tracking as a more naturalistic paradigm, which allows readers to regress to earlier sentences, would be a fruitful next step of research. Finally, the present research is also limited because we examined only three levels of plausibility, two levels of source credibility, and only one type of source credibility (expertise). A more comprehensive understanding of the interplay of plausibility and source credibility in validation could be gained by including a broader range of degrees of plausibility and credibility and other types of source credibility (such as trustworthiness).

To conclude, the present experiment yielded three important insights. First, we present further evidence for validation during text comprehension as found by numerous studies with the contradiction paradigm (e.g., O'Brien et al., 1998). Second, we provide further support for the general assumption that source credibility as contextual information and plausibility are jointly considered in validation but that source information might be considered after a slight delay. Third and most importantly, the assumption was supported that the role of source credibility depends on the degree of (im-)plausibility. The extent that source credibility affects validation seems to depend on the outcome of initial, knowledge-based validation processes that determine the degree of (im-)plausibility.

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Appendix

Table A1

Means and Standard Deviations of the Dependent Variables by Experimental Condition

Plausibility	Source Credibility	Target Sentence (ms)	Spillover Sentence (ms)	Plausibility Ratings
		M (*SD*)	*M* (*SD*)	*M* (*SD*)
Plausible	High Expertise	3798 (1379)	2594 (928)	5.75 (1.65)
	Low Expertise	3738 (1323)	2576 (939)	5.40 (1.61)
Somewhat	High Expertise	3995 (1616)	2570 (891)	3.70 (2.08)
Implausible	Low Expertise	4050 (1560)	2704 (974)	3.54 (1.94)
Highly	High Expertise	3983 (1473)	2777 (1030)	1.96 (1.61)
Implausible	Low Expertise	4150 (1556)	2606 (946)	2.29 (1.71)

Note. Plausibility ratings range from 1 (*not plausible at all*) to 7 (*very plausible*).

6   Study 3: Source Credibility and Plausibility are considered in the Validation of Text Information: Evidence from a Social Media Context

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Abstract

Two experiments examined the interplay of message plausibility and source credibility in the validation of texts embedded in a social media context. We varied plausibility of tweet-like messages with text-belief consistency (Experiment 1) or world-knowledge consistency (Experiment 2). Source credibility was varied via the message's fit with the typical argumentative position of the source (source-message consistency, Experiment 1) or via the reputation of media organizations (Experiment 2). Reading times served as an implicit indicator for validation processes and participants rated the tweets' plausibility and source credibility. In Experiment 1, main effects of text-belief and source-message consistency on reading times and plausibility ratings emerged including an interaction effect on plausibility ratings. Participants read belief-inconsistent messages longer and judged these as less plausible compared with belief-consistent messages. Similarly, participants read messages from message-inconsistent sources longer and judged these as less plausible compared with message-consistent sources. Experiment 2 revealed an unexpected interaction effect. Participants read plausible messages by low-credible sources longer. No interaction effect emerged on plausibility ratings. In sum, the results suggest that source credibility and plausibility are considered in the validation of textual information. However, their exact relationship seems to depend on contextual factors including the salience of the source information.

Keywords: Validation, Text Comprehension, Text-belief Consistency, Source Information, Source Credibility

Readers using the World Wide Web to research information are faced with a large amount of information, which often includes inaccurate and imbalanced information. Virtually anyone can post information on social media outlets such as Twitter and spread information with little gatekeeping (e.g., Vosoughi et al., 2018). Most of the existing research on the evaluation of the information accuracy in an online context has focused on biasing effects of motivated processing such as the strategic preference for information and more positive evaluations of information that aligns with self-beliefs (Kahne & Bowyer 2017). In this article, we study the evaluation of online information from a different theoretical perspective, starting from the assumption that the comprehension of online information already entails a passive process called validation, that is, a general mechanism that implicitly evaluates the consistency of incoming text information with the current mental model, accessible world knowledge, and prior beliefs (Richter, 2015).

Experimental approaches based on a variety of paradigms suggest that validation is an integral and routine component of text comprehension (e.g., Ferretti et al., 2008; Maier & Richter, 2013; Rapp & Kendeou, 2009; Richter et al., 2009; Schroeder et al., 2008). However, research on contextual factors affecting validation has been more recent (e.g., Gilead et al., 2019; Guéraud et al., 2018; Piest et al., 2018; Singer & Doering, 2014). We propose that source credibility is a specific type of contextual information that is particularly important for validation because it may signal to the reader whether information provided by the source is believable or not. Thus, source credibility itself bears a strong conceptual overlap to validity, permitting source credibility to affect the validation of information.

We examine the extent that source credibility is considered in the validation of text information in a social media context for which the evaluation of the plausibility of information is a particularly important issue (Metzger et al., 2010). In two experiments, we used short messages in Twitter style (i.e., tweets) with varying plausibility (text-belief or world-knowledge consistency) and varying source credibility (source-message consistency or

reputation of a media organization). We collected plausibility and source credibility judgments as explicit and reading times as implicit measurements to receive a thorough understanding of online and offline evaluation processes (Rapp & Mensink, 2011).

In the following review, we start with research on validation and the text-belief consistency effect, which provides the conceptual framework for this article. We then briefly review relevant research on the evaluation of source information and the available studies that have investigated combined effects of plausibility and source credibility on validation. This discussion forms the basis for the hypotheses tested in the current experiments.

Validation of Text Information: Implicit Plausibility Checks

Plausibility may be defined as the "acceptability or likelihood of a situation or a sentence describing it" (Matsuki et al., 2011, p. 926). Readers continually check the plausibility of incoming text information against activated world knowledge and relevant beliefs in a routine and nonstrategic process called validation (O'Brien & Cook 2016a, 2016b; Richter, 2015; Singer, 2013, 2019). Different lines of research support the assumption of a routine validation process. For example, Richter et al. (2009) introduced a Stroop-like paradigm (Stroop, 1935) to investigate routine validation processes. If validation is routine and nonstrategic, then reading world-knowledge inconsistent sentences should elicit a negative response tendency. This tendency should interfere with positive responses in an unrelated judgment task, implying that these judgments should be slowed down. Richter et al. (2009) found this slow-down (epistemic Stroop effect) in two experiments with true and false sentences, which support the assumption of the involuntary and routine character of validation processes. A growing body of research with different stimuli, such as true versus false, merely plausible versus implausible sentences, and matching versus mismatching audiovisual information to opinion statements testifies to the robustness and generality of the epistemic Stroop effect (e.g., Gilead et al., 2019; Isberner & Richter, 2013, 2014; Piest et al., 2018). Experiments based on eye-tracking (Matsuki et al., 2011), event-related potential data (e.g.,

Ferretti et al., 2008), and reading times (e.g., Cook & O'Brien, 2014) provide further evidence for routine validation. For example, numerous experiments with the inconsistency paradigm show that reading times are longer for sentences that conflict with information provided earlier in the text and pertinent prior knowledge (e.g., O'Brien et al., 1998).

O'Brien and Cook (2016a, 2016b) proposed the Resonance-Integration-Validation Model (RI-Val) in which resonance, integration, and validation are three passive, asynchronous processes that once started run to completion. A resonance-like process triggered by the information activates memory-based knowledge (*R*; Myers & O'Brien, 1998; O'Brien & Myers, 1999). Based on conceptual overlap, linkages between the information and content in active memory are made (*I*). In a third process, these linkages are validated against information in active memory (*Val*). The three processes start asynchronously but overlap and work in a cascaded style.

Validation and Text-belief Consistency Effects

Validation is based on reader's world knowledge but also on prior beliefs (Richter, 2015). For example, reading text information about a controversial socioscientific topic (e.g., climate change) might activate relevant prior beliefs among other aspects. To evaluate this information, readers may use relevant prior beliefs to validate text information, which in turn affects comprehension processes and outcomes. Gilead et al. (2019) showed that statements contradicting personal beliefs (e.g., "The Internet has made people more isolated/sociable") elicit the same epistemic Stroop effect in comprehension processes, indicating a negative response tendency, which has been found with world-knowledge inconsistent sentences. Numerous studies have also shown that under most circumstances readers comprehend belief-consistent information to a greater extent than belief-inconsistent information (text-belief consistency effect; e.g., Maier & Richter, 2013, 2014; Maier et al., 2018; Schroeder et al., 2008; Wiley, 2005). In their Two-Step Model of Validation, Richter and Maier (2017) posit that these effects are due to the validation mechanism. By default, information detected as

implausible during comprehension (e.g., belief-inconsistent information) is processed in a

relatively shallow manner, leading to a mental model that is biased towards readers' prior

beliefs. Such text-belief consistency effects occur with different types of texts, different types

of assessments of prior beliefs, and different types of comprehension measures (for reviews,

see Richter & Maier, 2017; Richter et al., 2020). In conclusion, a growing body of research on

validation and text-belief consistency effects suggests that readers routinely assess the

plausibility during reading and validate it against relevant world knowledge and prior beliefs,

yet the possible influence of source information on validation has received relatively little

attention.

The Roles of Source Credibility and Plausibility in Text Comprehension

The credibility of a source conveying information is conceptually and empirically

related to the validity of the information. In general, a credible source signals to a reader that

the information may be deemed valid. Research on source credibility usually focuses on the

two factors expertise and trustworthiness (Lombardi et al., 2014; Self, 2009). The experiments

reported in this article focused on trustworthiness, which may be defined as the extent to

which a speaker is perceived to be motivated to make correct assertions (Hovland et al.,

1953).

When readers comprehend multiple texts that describe or discuss a specific topic from

different or even conflicting perspectives (e.g., scientific texts dealing with the same

phenomenon or argumentative texts advocating different positions in a political debate),

source information is particularly relevant (e.g., Bråten & Braasch, 2018). In multiple text

comprehension, a reader ideally constructs a document model, which is a mental

representation that consists of an intertext model and an integrated mental model (Perfetti et

al., 1999). Source information is relevant for the construction of an adequate intertext model

that includes source information along with the semantic and argumentative links between

multiple documents. However, source information, and especially cues to the credibility of

the source, is also relevant for constructing an integrated mental model because it can be used strategically to weigh and select information that should be included in the integrated mental model. Broadly in line with these assumptions, several studies indicate that multiple text comprehension improves when readers engage in the processing of credibility-related source features such as evaluating texts for trustworthiness based on source characteristics (e.g., Anmarkrud et al., 2014; Bråten et al., 2009; Goldman et al., 2012; Wiley et al., 2009; Wineburg, 1991).

The Discrepancy-Induced Source Comprehension Model (D-ISC model; Braasch et al., 2012) focuses specifically on the processing of conflicting information by multiple sources. The model holds that inconsistencies within a text or between texts prompt readers to pay more attention to source information. To test this assumption, Braasch et al. (2012) presented participants with two-sentence news reports, collected eye movements, and memory data. Stories consisted of consistent or discrepant claims made by two sources. Discrepant claims increased attention for source information, as indicated by eye-tracking data and memory of source information (for similar results, see Kammerer et al., 2016; Rouet et al., 2016). The basic idea of the D-ISC model has also been supported by studies with implausible (belief-inconsistent) information (e.g., Bråten et al., 2016; de Pereyra et al., 2014).

The D-ISC model predicts how inconsistent or implausible information affects the processing of source information. Only a handful of studies to date have addressed the complementary question of how source information affects the processing of implausible information in a text. Foy et al. (2017, Experiment 1) used short narratives with a person introduced as a trustworthy or untrustworthy source (e.g., a sober vs. drugged person). Later in the story, this source would state something implausible (e.g., "There are wolves in the backyard"). Participants read the implausible assertions and the subsequent (spillover) sentences faster when these assertions came from a trustworthy compared to an untrustworthy source, indicating that source credibility affected validation in making the implausible

assertion appear more plausible. In contrast to Foy et al. (2017, Experiment 1) who used assertions that were merely implausible in the story world, Wertgen and Richter (2020) used assertions that were clearly consistent or inconsistent with world knowledge and varied source credibility through expertise. A source introduced as an expert or non-expert in a specific field (e.g., physics) stated a fact consistent with general world knowledge (e.g., "the relativity theory is a theory by Einstein") or inconsistent with general world knowledge (e.g., "the relativity theory is a theory by Newton"). In addition to plausibility and source credibility ratings as explicit measurements of evaluation (Experiment 1), Wertgen and Richter used reading times on target and spillover sentences as an online indicator of validation (Experiment 2). Analyses revealed an interaction effect of plausibility and source credibility on plausibility ratings and reading times. Participants rated the plausibility of an assertion slightly higher when a low-credible source stated a world-knowledge inconsistent assertion compared to a high-credible source. Similarly, reading times were longer for a high-credible source stating a world-knowledge inconsistent assertion compared to a low-credible source. Interestingly, this pattern of results emerged on spillover sentences as well, showing partial convergence of online and offline processes for the validation of world-knowledge inconsistent information (Rapp & Mensink, 2011). Wertgen et al. (2021) extended this research by including an intermediate condition of somewhat implausible but not clearly world-knowledge inconsistent assertions. Otherwise, the design of the experiment was the same as the design used by Wertgen and Richter (2020). Reading times increased and plausibility decreased from knowledge-consistent to implausible to knowledge-inconsistent assertions. Moreover, interactions of source credibility and plausibility were found for reading times of spillover sentences and plausibility judgments, indicating that source credibility and plausibility are jointly considered in validation. High-credible sources increased the plausibility of somewhat implausible assertions but exacerbated the perceived implausibility of knowledge-inconsistent assertion. A corresponding interactive pattern was found for the

reading times of the spillover sentences. Thus, the effects of source credibility on implicit validation processes and explicit plausibility judgments seems to depend on the degree of implausibility.

Rationale of the Present Experiments

The present research examined the interplay of source credibility and plausibility in short multiple documents embedded in a social media context. The impact of source credibility on text comprehension has been investigated primarily in the context of multiple documents comprehension, and few studies have investigated the interplay of source credibility and plausibility in the validation of information. We constructed short messages and presented these in an authentic, Twitter-like setting. Twitter is a popular microblogging social media network that is famous for short messages, often with political or socioscientific controversial contents (Maireder & Ausserhofer, 2014). In Twitter messages, message and source information are displayed together. With these features, Twitter seems like an ideal environment for the experimental and ecologically valid study of interactions of source credibility and message plausibility.

In two experiments, we varied plausibility of the messages either by manipulating text-belief consistency (Experiment 1) or world-knowledge consistency (Experiment 2). We also manipulated source credibility, more specifically trustworthiness, in two different ways. In Experiment 1, we varied whether the source expresses an authentic message that fits their known argumentative positions (e.g., The oil company Shell supporting the claim of natural causes of climate change) or not (e.g., The oil company Shell supporting the claim of man-made causes of climate change). We label this type of source credibility as source-message consistency. In Experiment 2, we varied trustworthiness of the source by using reputable versus yellow-press media sources for the Twitter messages.

We collected reading times as an implicit, online indicator for validation processes. Longer reading times for belief-inconsistent or implausible information are usually interpreted

as indicating that the inconsistency has been detected, which slows down processing. In a separate run, we asked the same participants who first read the messages for comprehension to read them again and explicitly judge the presented Twitter messages with regard to plausibility and source credibility. Using both kinds of data allows a better understanding of online and offline processes during reading, particularly by determining the extent that indicators of validation during reading and offline judgments of the plausibility of text information converge (Rapp & Mensink, 2011).

Based on the existing research examining the combined effects of source credibility and plausibility (Braasch et al., 2012; Foy et al., 2017; Wertgen & Richter, 2020; Wertgen et al., 2021), our general assumption was that both aspects, plausibility and source credibility, are considered for validation.

In Experiment 1, we expected main effects of plausibility and source-message consistency on the online and offline indicator of validation. Thus, in line with previous studies that found a disruptive effect of belief-inconsistent or implausible information (e.g., Maier et al., 2018; Wertgen & Richter, 2020; Wertgen et al., 2021), readers were expected to take longer for reading belief-inconsistent texts compared to belief-consistent texts (Hypothesis 1.1). Likewise, an inconsistency of source and message should have a similar disruptive effect on reading and lead to longer reading times than consistent sources and messages (Hypothesis 1.2). Moreover, readers might especially consider source credibility when they are confronted with belief-inconsistent information, attempting to resolve the inconsistency (as posited by the D-ISC assumption, Braasch et al., 2012). Learning that the belief-inconsistent information comes from an authentic, trustworthy source that is known for advocating this position allows for a resolution of the conflict, but learning that the information comes from an unauthentic, untrustworthy source that usually stands for a different position allows for no resolution. This latter scenario might instead increase the conflict and hence the reading time. Therefore, the predicted effect of source credibility might

be even larger for belief-inconsistent messages, which would amount to an ordinal interaction of the two independent variables. We examined this possibility as an open research question (Open Research Question 1).

For the explicit plausibility ratings, we expected a main effect of text-belief consistency (Hypothesis 1.3) that mirrors its predicted effect on reading times. Starting with the definition of plausibility by Connell and Keane (2006), we assumed that readers base their judgments of plausibility primarily on the fit of the message with their beliefs. However, trustworthiness in the sense of source-message consistency might also affect the perceived plausibility of the message. In particular, we expected messages from trustworthy sources to be evaluated as more plausible than messages from untrustworthy sources (Hypothesis 1.4). Again, the latter effect might be even more pronounced in belief-inconsistent messages that, according to the D-ISC hypothesis, should increase the likelihood that readers consider source information in their judgments. We examined this possibility as an open research question (Open Research Question 2). Finally, we expected ratings of source credibility to be higher for message-consistent sources (Hypothesis 1.5). This comparison served as a manipulation check for source credibility in Experiment 1.

In Experiment 2, a slightly different pattern was expected, given the different operationalization of source credibility. We expected a main effect of plausibility (operationalized as world-knowledge consistency) on the reading times and the plausibility ratings (Hypothesis 2.1 and 2.3). However, source credibility (operationalized as reputation of media sources) was expected to interact with plausibility. Readers were expected to take longer for implausible texts presented by high-credible sources (Hypothesis 2.2) compared to a matching combination of implausible texts presented by low-credible sources (see Wertgen & Richter, 2020). Similarly, plausible statements from a high-credible source might be judged as even more plausible, whereas implausible statements might be judged as even more implausible when coming from a high-credible source. Thus, we expected an interaction of

plausibility and credibility for the explicit plausibility ratings (Hypothesis 2.4). Finally, as a manipulation check, we used the credibility ratings to test whether the high-credible sources were judged as more credible than the low-credible sources (Hypothesis 2.5).

Experiment 1

Experiment 1 investigated the effects of plausibility, operationalized as text-belief consistency, and source credibility, operationalized as source-message consistency, on reading times and explicit ratings of plausibility and source credibility.

Method

Participants

We recruited 64 participants with an average age of 25.39 years ($SD = 7.52$ years). Most of them were university students (84.38%) and female (82.81%). Eleven participants reported a first language other than German (five participants) or a bilingual background (six participants). Participants received 13 Euros or study credit for participation.

Materials

We created 64 short texts about four socioscientific, controversial topics. The filler and experimental texts (the original German versions and English translations) are available in the online supplementary material. The topics were vaccination, anthropogenic versus natural causes of climate change, the use of digital media in educational contexts and the use of glyphosate as an herbicide. For every topic, 16 texts were created, 8 arguing for one position and 8 arguing for the opposite position in the controversy. We combined the texts with matching and non-matching sources associated with either one of the argumentative positions in the controversy. All items were designed in the style of Twitter messages. Each tweet consisted of a small profile picture in the upper left corner, the text, the name of the source, the Twitter short name of the source and a date and time. The Twitter short name of the source, date and time were typeset in a lighter grey. The profile picture was that of the original Twitter account of the source or we chose an authentic alternative if no profile picture

was available. Sources were media outlets (e.g., Fox News), companies (e.g., Monsanto, Shell, Cornelsen), foundations or other non-profit organizations (e.g., World Health Organization, Greenpeace), ministries (e.g., Bavarian ministry of education), professional organizations (e.g., German organization of the automobile industry), political parties (e.g., Die Grünen), or public persons (e.g., Donald Trump). Additionally, all Twitter messages had the typical features such as a "like" and a "share" button (see Figure 6.1 for examples). The length of the texts between topics varied within the limits set by Twitter (max. 280 characters), but the lengths of the texts within a topic were very similar (glyphosate: $M = 206.50$ characters, $SD = 10.63$ characters; vaccination: $M = 201.88$ characters, $SD = 7.03$ characters; climate change: $M = 195.06$ characters, $SD = 9.08$ characters; digital media: $M = 214.31$ characters, $SD = 11.82$ characters). In addition, we created 64 filler Twitter messages about non-controversial, apolitical topics (e.g., concerts), of similar length ($M = 203.48$ characters, $SD = 11.75$ characters).

We conducted two post hoc norming studies to assess how students perceive the messages and the sources used in the experimental texts. Belief-consistent texts ($M = 3.74$, $SE = 0.09$) were judged as more plausible compared with belief-inconsistent texts ($M = 2.83$, $SE = 0.09$), $t(55.4) = 8.33$, $p < .001$, $d = 0.83$. Sources associated with a belief-consistent message ($M = 3.27$, $SE = 0.09$) were judged as more credible compared with sources associated with a belief-inconsistent message ($M = 2.44$, $SE = 0.09$), $t(125) = 5.74$, $p < .001$, $d = 0.81$. The probability for sources to be associated with a belief-consistent message was higher for sources that were intended to be associated with a belief-consistent message ($M = .99$, $SE = .00$) compared with sources intended to be associated with a belief-inconsistent message ($M = .06$, $SE = .02$), $z = 14.01$, $p < .001$. These findings suggest that the manipulation of plausibility and source credibility was successful. For a full description and results of the post hoc pilot studies, see the online supplemental material.

Figure 6.1

Translated Example Tweets from Filler and Experimental Trials from Experiment 1[2]
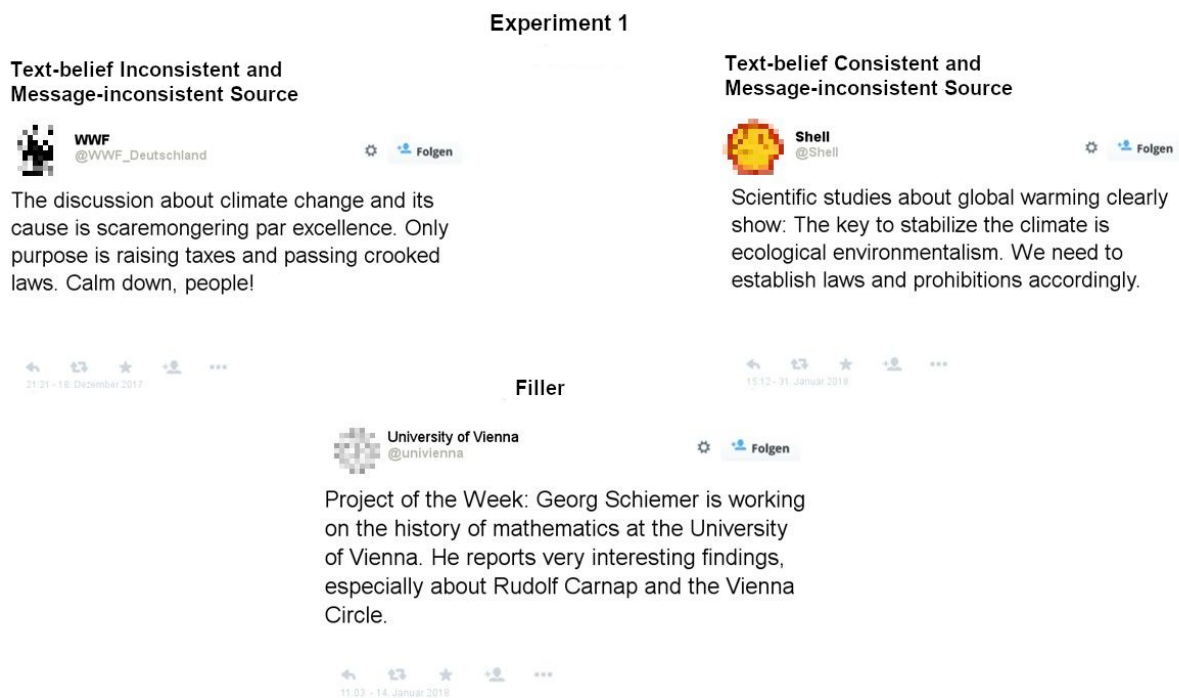
Prior Beliefs

      Participants' prior beliefs were assessed approximately one week before the experiment took place. Participants judged the likelihood that a statement is true on a scale from 0 to 100%. We used 10 items for each of the four topics, with five items stating a pro stance and five items stating a contra stance. We used the 7-point scales for the topics vaccination and climate change from Maier and Richter (2013). The internal consistencies were satisfactory (glyphosate: Cronbach's α = .91, climate change: Cronbach's α = .89, vaccination: Cronbach's α = .92, digital media in education: Cronbach's α = .87).

Procedure

      Participants were tested in groups of up to eight at a time. The experiment consisted of two parts. In the first part, we instructed participants to read the messages carefully and for comprehension because they would later answer a comprehension task to some of the read

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[2] Profile pictures of the example items have been pixelized for trademark reasons. Participants saw the items in a non-pixelized version.

messages. Participants read 64 experimental and 64 filler messages on a computer screen in a

self-paced fashion and in randomized order. The experimental software was Inquisit 5

(Millisecond Software, 2016). A fixation cross was presented for 500 ms before every trial.

After every filler tweet, participants judged whether a statement in the tweet was true or false

by pressing "d" or "k". Half of the statements required "true" as an answer. For example, the

filler tweet (Figure 6.1) required the verification of the statement "Georg Schiemer's research

focuses on different mathematicians" (the correct response would be "true"). None of the

questions required specific prior knowledge but could be answered based on the information

communicated in the messages. After the reading task, participants could take a short break.

In the second part, we instructed participants to rate either plausibility on a scale from 1 (*not*

plausible at all) to 7 (*very plausible*) or source credibility from 1 (*not credible at all*) to 7

(*very credible*). To this end, participants saw the same 64 experimental messages again in a

randomized order. Finally, participants provided sociodemographic data and were reimbursed.

Design

The design was a 2 (text-belief consistency: belief-consistent vs. -inconsistent) x 2

(source-message consistency: message-consistent vs. -inconsistent) within-subjects design.

All participants read the texts in the first part of the experiment. In the second part, half of the

participants provided plausibility ratings for the messages, the other half provided ratings of

source credibility for the Twitter accounts posting the message. Two item lists ensured a

counterbalanced assignment of Twitter messages to experimental conditions across

participants.

Results and Discussion

We conducted linear mixed models with the lmer function of the R package lme4

version 1.1-23 (Bates et al., 2015) for all linear mixed models (Baayen et al., 2008) and used

the emmeans function in the emmeans package (Version 1.4,7; Lenth, 2016) for follow-up

tests to interpret interactions. The Type I error probability was set at .05 (two-tailed) in all significance tests unless stated otherwise.

Participants and items were entered as random effects (random intercepts) in the models. The main effects of the two contrast-coded independent variables and their interaction were entered as fixed effects in the models. Belief-consistent messages were coded as 1 and belief-inconsistent messages were coded as -1. Message-consistent sources were coded as 1 and message-inconsistent source were coded as -1. The position in the experiment and the character count of a tweet were entered in the model as centered predictors. Reading times were log-transformed for analyses and contrasts were back-transformed from their logarithmic model estimates and are reported in milliseconds.

We estimated effect sizes (Cohen's d) for differences in condition means based on the approximate formula proposed by Westfall et al. (2014) for linear mixed models with contrast codes and tests with $df = 1$ (see also Judd et al., 2017). Furthermore, we conducted a post-hoc sensitivity analysis of the effects based on the method proposed by Westfall et al. (2014), as implemented in the accompanying web-based app (https://jakewestfall.shinyapps.io/crossedpower/). For the post-hoc sensitivity analysis, we used the standardized variance components of the random effect of participants (0.07), the random effect of items (0.05) and the residual variance (0.88) taken from the corresponding linear mixed model (source credibility ratings of Experiment 1). All other variance components were assumed to be 0 because the random intercept of participants and stories were the only random effects in the model. With the given sample size of 31 participants and 64 messages for source credibility ratings of Experiment 1, effects of $d = 0.099$ or higher could be detected with a power (1-β) of .90 and a Type I error probability of .05.

Prior Beliefs

Prior beliefs differed between topics but most participants agreed more with one side of the debate. The average agreement was 73.59% ($SD = 16.68\%$) for the position that the

herbicide glyphosate is more toxic than beneficial, 76.64% (*SD* = 15.98%) for the position

that climate change is due to anthropogenic causes, 74.94% (*SD* = 21.07) for the position that

vaccination is more beneficial than harmful and 62.50% (*SD* = 15.86%) for the position that

digital media is beneficial rather than harmful in educational contexts.

Data Cleaning of Reading Times

Data of non-native speakers (eleven participants; 704 data points, 17.19% of data) and

data of participants with less than 65% accuracy in the reading comprehension task (four

participants; 256 data points, 6.25% of data) were excluded from analysis. To ensure a clear-

cut manipulation of text-belief consistency, we excluded data with less than 50% agreement

to the majority position for each topic (400 data points, 9.77% of data). Moreover, reading

times (per character) outside the interval defined by ±3 *SD* from the item mean of the log-

transformed reading times were treated as outliers (76 data points, 1.86% of data). The final

sample consisted of 49 participants with a mean accuracy of 79.37% (*SD* = 6.49%) on the

comprehension task.

Reading Times

Table 6.1 provides estimates and significance tests of the fixed effects. We expected a

main effect of text-belief consistency, with longer reading times for belief-inconsistent

messages compared with belief-consistent messages (Hypothesis 1.1). A significant main

effect of text-belief consistency emerged, β = -0.027, $t(62)$ = -2.30, p = .025, d = -0.13. In

support of Hypothesis 1.1, participants read belief-consistent messages (*M* = 8,927 ms, *SE* =

346 ms) faster than belief-inconsistent messages (*M* = 9,416 ms, *SE* = 365 ms). Apparently,

participants used their prior beliefs to evaluate the Twitter messages, resulting in slower

validation processes for belief-inconsistent information as indicated by longer reading times.

Likewise, we predicted that varying source-message consistency might elicit longer

reading times for messages presented by message-inconsistent sources compared with

message-consistent sources (Hypothesis 1.2). Analysis revealed a significant main effect of

source-message consistency that supports Hypothesis 1.2, β = -0.019, $t(2,636)$ = -3.18, p = .001, d = -0.09. Message-inconsistent sources (M = 9,416 ms, SE = 365 ms) led to longer reading times compared with message-consistent sources (M = 8,927 ms, SE = 346 ms). An inconsistency of a source and message seems to produce a comparable disruptive effect on reading times as a text-belief inconsistency, which suggests that readers additionally considered source credibility for validation.

In addition to the expected main effects of text-belief consistency and source-message consistency, we explored the extent that reading times of belief-inconsistent messages could be modulated by source credibility as posited by the D-ISC assumption (Braasch et al., 2012) in our Open Research Question 1. In particular, we assumed a matching pair of a belief-inconsistent message by a message-consistent source could resolve the text-belief inconsistency by attributing it to the source, whereas a belief-inconsistent text by a message-inconsistent source would not allow a resolution. Hence, reading times of belief-inconsistent messages by a message-consistent source should be faster compared with a message-inconsistent source. Analysis revealed no significant interaction effect of text-belief consistency and source-message consistency, β = 0.003, $t(2638)$ = 0.48, p = .630 (Figure 6.2). However, the planned comparison for source-message consistency within belief-inconsistent messages was significant, $t(2638)$ = -2.58, p = .01, d = -0.11. Readers were faster to process a belief-inconsistent message when it was presented by a message-consistent source (M = 9,213 ms, SE = 366 ms) compared with a belief-inconsistent message by a message-inconsistent source (M = 9,623 ms, SE = 382 ms). Interestingly, source-message consistency seemed to also affect reading times of belief-consistent messages. A planned comparison between belief-consistent messages was significant, $t(2636)$ = -1.91, p = .03 (one-tailed), d = -0.08. Belief-consistent messages by a message-consistent source (M = 8,785 ms, SE = 348 ms) were read faster compared with a message-inconsistent source (M = 9,072 ms, SE = 360 ms).

Finally, two control variables, the item position within the experiment and the text length of a message, had significant effects on reading times. Less time was needed to read messages presented later in the experiment. Longer messages led to longer reading times.

In sum, the results show that text-belief consistency and source-message consistency are both considered for validation of Twitter messages about socioscientific topics during moment-by-moment processing, with processing advantages for belief-consistent texts and message-consistent sources. Moreover, the results can be interpreted in light of the D-ISC assumption (Braasch et al., 2012), which predicts extended processing effort on source information for readers confronted with discrepant or inconsistent information. Thus, readers possibly took longer to process belief-inconsistent messages presented by a message-inconsistent source in an attempt to dissolve the belief-inconsistency, whereas belief-inconsistent messages presented by a message-consistent source led to faster reading times, possibly because the belief-inconsistent information could be easily attributed to the source. Note, however, that this interpretation must be seen with caution given that the corresponding interaction effect was not significant, and an effect of message-consistency of the source was also found for belief-consistent messages. Apparently, readers also considered this specific type of source credibility when the message was consistent with their beliefs, a finding that would not be predicted by the D-ISC assumption.

Table 6.1

Estimated Coefficients, Standard Errors, Degrees of Freedom, and t Values for the Linear

Mixed Model of the Reading Times in Experiment 1

	Est.	*SE*	*df*	*t*	*p*
(Intercept)	9.124	0.037	54.75	246.54	< .001
Item Position	-0.096	0.006	2626	-15.90	< .001
Text Length	0.038	0.016	62.83	3.26	< .001
Source-message Consistency	-0.019	0.006	2636	-3.18	.001
Text-belief Consistency	-0.027	0.012	61.57	-2.30	.025
Source-message Consistency x Text-belief Consistency	0.003	0.006	2638	0.48	.630

Note. Source-message consistency (contrast coded: message-consistent = 1, message-inconsistent = -1). Text-belief consistency (contrast coded: belief-consistent = 1, belief-inconsistent = -1).

Figure 6.2

Mean Reading Times of Experiment 1 with ±1 Standard Error by Experimental Condition
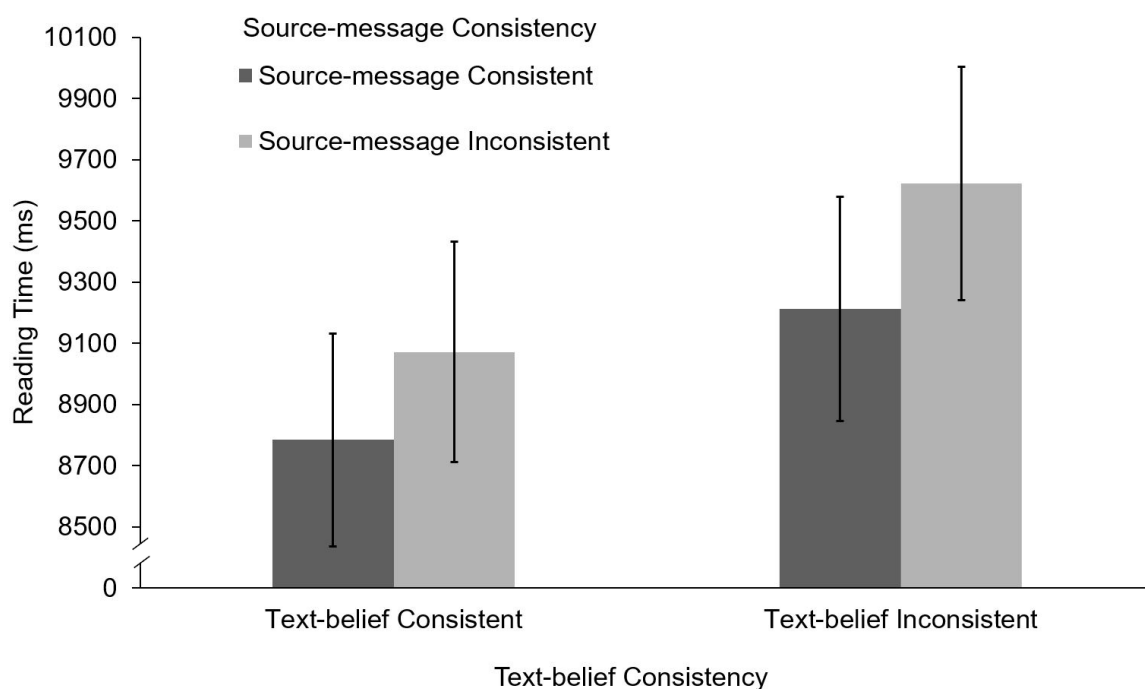
Specifications for Plausibility and Source Credibility Ratings

Data from participants with a prior belief score of less than 50% agreement were excluded (for plausibility ratings: 224 data points, 10.61%; source credibility ratings: 208 data points, 10.48%). Plausibility ratings were available from 33 participants and source credibility ratings from 31 participants.

Plausibility Ratings

Table 6.2 provides estimates and significance tests of the fixed effects. We expected participants to judge belief-consistent messages as more plausible compared with belief-inconsistent messages (Hypothesis 1.3). In support of this hypothesis, we found a strong main effect of text-belief consistency on plausibility ratings, $\beta = 1.10$, $t(61) = 14.41$, $p < .001$, $d = 1.36$. Belief-consistent messages ($M = 5.23$, $SE = 0.12$) were judged as more plausible as belief-inconsistent messages ($M = 3.03$, $SE = 0.12$). Participants used the consistency of their belief with the position of the text as a major criterion for their plausibility judgments.

Similarly, we expected a main effect of source-message consistency with higher plausibility ratings for messages by message-consistent sources compared with message-inconsistent sources (Hypothesis 1.4). In support of this hypothesis, participants judged messages as slightly more plausible presented by a message-consistent source ($M = 4.24$, $SE = 0.10$) compared with a message-inconsistent source ($M = 4.01$, $SE = 0.10$), $\beta = 0.12$, $t(1797) = 3.32$, $p < .001$, $d = 0.14$. Apparently, sources that made authentic statements that fit with their known argumentative position also increased the plausibility of the Twitter messages.

Following the D-ISC assumption (Braasch et al., 2012), we explored whether the source-message consistency effect might be more pronounced in belief-inconsistent messages because readers might increase their attention to source information based on the inconsistency (Open Research Question 2). The analysis revealed a significant interaction effect of text-belief consistency and source-message consistency (Figure 6.3), $\beta = 0.09$, $t(1797) = 2.57$, $p = .010$. Unexpectedly, no significant difference in plausibility ratings

emerged between belief-inconsistent messages presented by a message-consistent source ($M =$ 3.05, $SE = 0.13$) compared with a message-inconsistent source ($M = 3.00$, $SE = 0.13$), $t(1799)$ = -0.53, $p = .593$. Apparently, source credibility was not considered when explicitly evaluating the plausibility of belief-inconsistent messages, possibly because the belief-inconsistent messages were implausible based on the conflict with participants' beliefs. Interestingly, the perceived plausibility of belief-consistent messages was boosted when it came from a message-consistent source ($M = 5.43$, $SE = 0.13$) compared with a message-inconsistent source ($M = 5.02$, $SE = 0.13$), $t(1799) = 4.17$, $p < .001$, $d = 0.25$.

Table 6.2

Estimated Coefficients, Standard Errors, Degrees of Freedom, and t Values for the Linear Mixed Model of the Plausibility Ratings in Experiment 1

	Est.	*SE*	*df*	*t*	*p*
(Intercept)	4.13	0.09	69.57	43.99	< .001
Source-message Consistency	0.12	0.03	1797	3.32	< .001
Text-belief Consistency	1.10	0.08	61.36	14.410	< .001
Source-message Consistency x Text-belief Consistency	0.12	0.03	1797	2.57	.010

Note. Source-message consistency (contrast coded: message-consistent = 1, message-inconsistent = -1). Text-belief consistency (contrast coded: belief-consistent = 1, belief-inconsistent = -1).

Figure 6.3

Mean Plausibility Ratings of Experiment 1 with ±1 Standard Error by Experimental

Condition
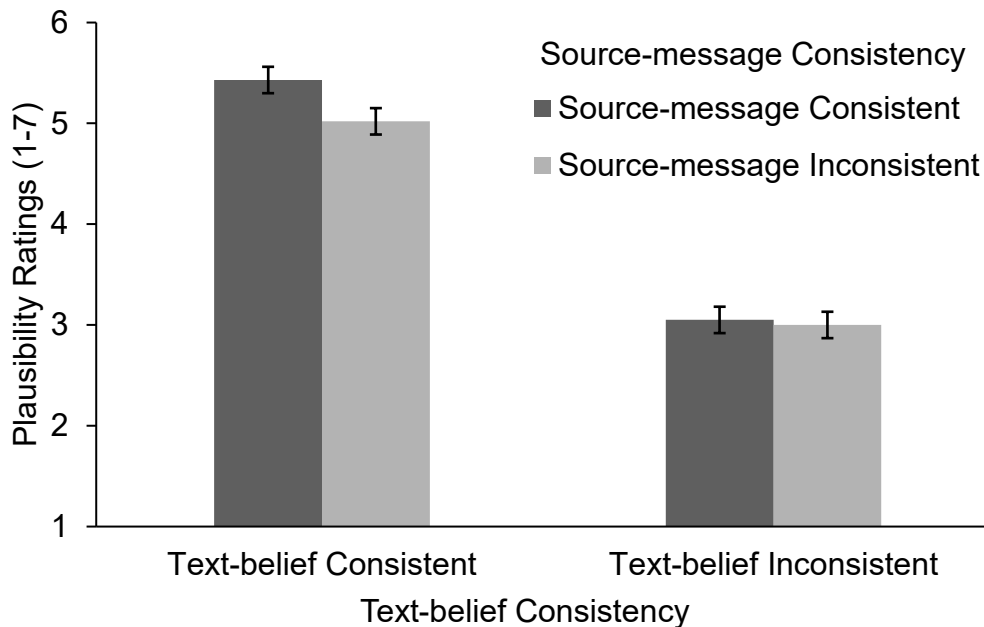
Source Credibility Ratings

A similar pattern of results emerged for source credibility ratings (Figure 6.4). The analysis

revealed the main effect of source-message consistency predicted in Hypothesis 1.5.

Message-consistent sources received higher source credibility ratings ($M = 4.04$, $SE = 0.11$)

compared with message-inconsistent sources ($M = 3.42$, $SE = 0.11$), $\beta = 0.31$, $t(1684) = 7.97$,

$p < .001$, $d = 0.36$. Thus, the manipulation of source credibility via source-message

consistency was successful.

Additionally, the analysis revealed a significant main effect of text-belief consistency,

$\beta = 0.57$, $t(62) = 9.06$, $p < .001$, $d = 0.65$. Belief-consistent messages led to higher source

credibility ratings ($M = 4.30$, $SE = 0.12$) than belief-inconsistent messages ($M = 3.16$, $SE =$

0.12). Moreover, these main effects were qualified by a significant interaction effect, $\beta =$

0.33, $t(1684) = 7.97$, $p < .001$. A combination of belief-consistent messages and message-

consistent sources led to higher source credibility ratings ($M = 4.93$, $SE = 0.13$) compared

with a belief-consistent message by a message-inconsistent source ($M = 3.66$, $SE = 0.13$),

$t(1683) = 11.57$, $p < .001$, $d = 0.73$. We found no significant difference in source credibility

ratings for belief-inconsistent messages stated by a message-consistent compared with a

message-inconsistent source, $\beta = -0.03$, $t(1683.39) = -0.31$, $p = .754$. Again, the item position

in the experiment was significant, $\beta = -0.10$, $t(1720) = -2.52$, $p = .011$. Later presented

messages led to slightly lower source credibility ratings.

Figure 6.4

Mean Source Credibility Ratings of Experiment 1 with ±1 Standard Error by Experimental

Condition
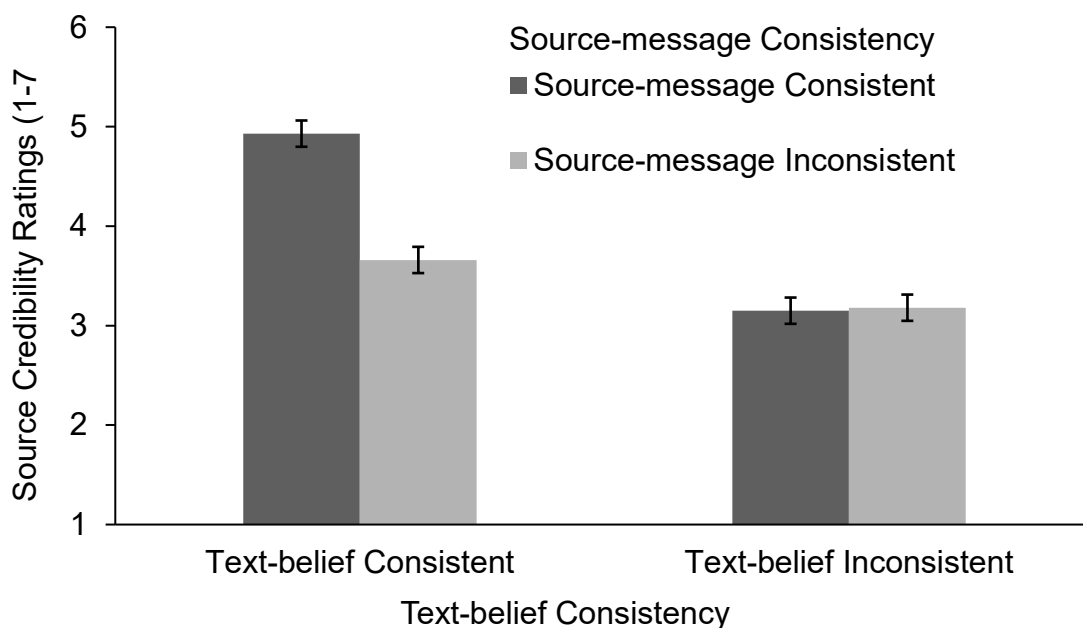
Experiment 1 investigated the extent that plausibility and source credibility are

considered in the validation of socioscientific controversial texts embedded in a social media

context. In support of the Hypotheses 1.1 and 1.3, belief-consistent texts were read faster and

judged as more plausible compared with belief-inconsistent texts. This finding is in line with

research on the text-belief consistency effect that shows processing advantages for belief-

consistent information (e.g., Maier et al., 2018; Wolfe et al., 2013). Similarly, texts by

message-consistent sources were read faster and judged as more plausible compared with message-inconsistent sources (e.g., Lombardi et al., 2014), supporting Hypotheses 1.2 and 1.4. The latter effect of source credibility might be more pronounced in belief-inconsistent texts because a detected inconsistency potentially triggers readers to contemplate source information more (D-ISC assumption, Braasch et al., 2012), which we examined in our open research questions (Open Research Questions 1 and 2). No interaction effect emerged for reading times. However, the planned comparison revealed significant differences with faster reading times for belief-inconsistent texts by a message-consistent compared with a message-inconsistent source. Likewise, a belief-consistent text by a matching, message-consistent source elicited faster reading times than a message-inconsistent source. Moreover, we found an interaction effect of text-belief consistency and source-message consistency for plausibility ratings in support of this interpretation. Finally, our manipulation check of source credibility was supported (Hypothesis 1.5). Participants judged message-consistent sources as significantly more credible compared with message-inconsistent sources.

To conclude, convergent implicit and explicit indicators of validation show that source credibility and text-belief consistency are both considered in the validation of Twitter messages. The results can be interpreted in terms of theories on validation, especially the large effects of text-belief consistency on reading times and plausibility ratings (Richter & Maier, 2017). They are also partly coherent with theories that highlight the role of source credibility in the online processing and evaluation of information from multiple sources such as the D-ISC assumption (Braasch et al., 2012; Braasch & Bråten, 2017).

However, validation processes are not only based on readers' prior beliefs but also on world knowledge (Richter, 2015). Hence, a fruitful approach to further investigate the effects of source credibility and plausibility on validation of texts in a social media context would be to vary world-knowledge consistency and source credibility of Twitter messages. This

approach was pursued in Experiment 2, in combination with an operationalization of source credibility in terms of trustworthiness.

Experiment 2

We conducted Experiment 2 to further investigate the extent that plausibility and source credibility are considered in validation. Plausibility was manipulated via the consistency of text information with world knowledge. Source credibility was manipulated via the reputation of high- versus low-credible media outlets. As in Experiment 1, reading times, plausibility and source credibility ratings were the dependent variables, but the current experiment included a different manipulation of source credibility with partly divergent Hypotheses. We expected main effects of plausibility on reading times (Hypothesis 2.1) and plausibility ratings (Hypothesis 2.3) with longer reading times and lower plausibility ratings for implausible compared with plausible messages. However, unlike in Experiment 1, we expected plausibility and source credibility to interact on implicit and explicit indicators of validation. Reading times of implausible messages from high-credible sources should be longer compared with low-credible sources (Hypothesis 2.2). We also expected higher plausibility judgments for plausible messages from high-credible sources compared with low-credible sources. Conversely, implausible messages from high-credible sources should be rated as less plausible compared with low-credible sources (Hypothesis 2.4). As a manipulation check, we expected source credibility ratings to be higher for high-credible sources compared with low-credible sources (Hypothesis 2.5).

Method

Participants

Seventy-two participants with an average age of 26.61 years ($SD = 7.47$ years) took part in the experiment and received study credit or 7 Euros for participation. Most participants were female (76.39%) university students (83.33%) and reported German as a first language (84.72%).

Materials

We created 40 Twitter messages with four versions each (for examples, see Figure 6.5) based on a pilot study ($N = 25$). Every tweet was available in a plausible and an implausible version and combined with a high- or low-credible source. Sources were (online) newspapers (e.g., The Sun, Zeit Online), public (e.g., WDR) or private television broadcasts (e.g., RTL II), radio stations (e.g., Radio NDR) or other print media (e.g., Gala, Vice). Some texts had elements of famous conspiracy theories (e.g., the moon landing was fake). Fifty-six filler messages from Experiment 1 were used. Translated and original experimental texts and a description and the results of the pilot study are available in the online supplementary material. We assessed Locus of Control (IE-4; Kovaleva et al., 2012) and the Generic Conspiracy Belief Scale (GCBS; Brotherton et al., 2013) to control for possible affinities to conspiracy theories and for exploratory reasons. We excluded results for the two scales from the article because they are irrelevant for the hypotheses and had no significant influence on hypothesis-relevant results. For descriptions and results of the GCBS and IE-4, see the online supplemental material.

Figure 6.5

Translated Example Tweets from Experimental Trials from Experiment 2[3]
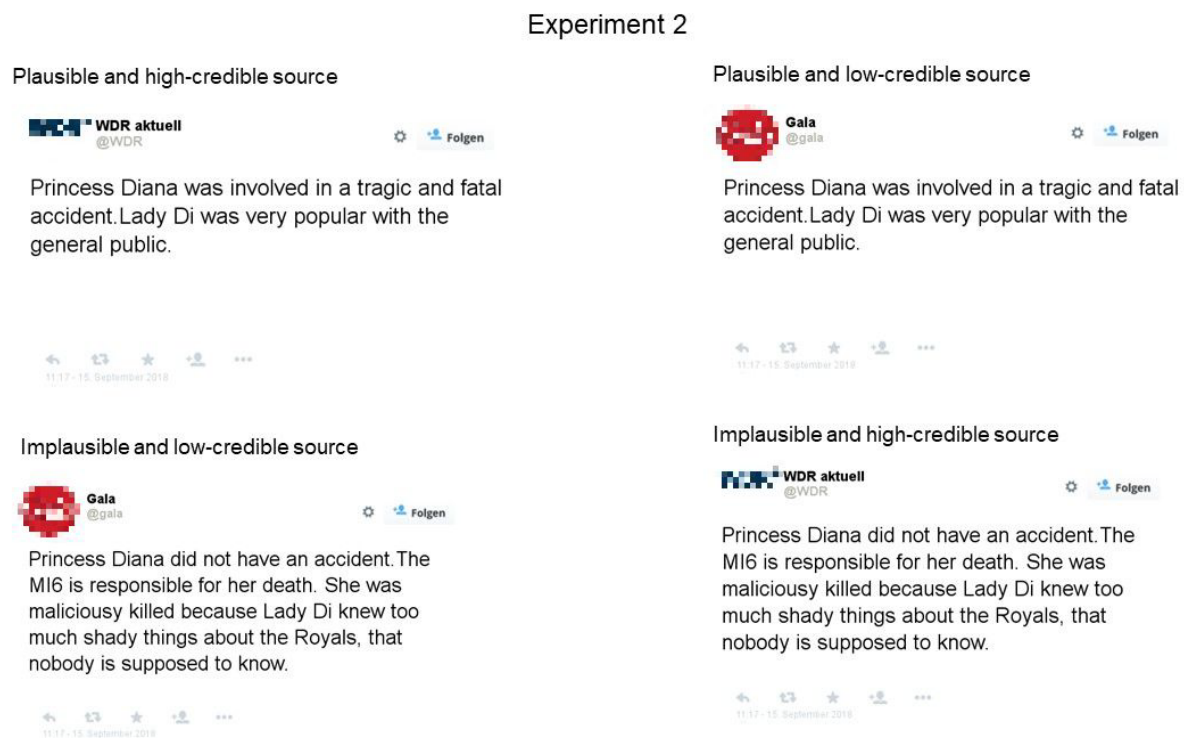
Experiment 2

Design

The design was a 2 (plausibility: plausible vs. implausible) x 2 (source credibility: high-credibility vs. low-credibility) within-subjects design. Four lists assured the counterbalanced assignment of Twitter messages to experimental conditions across participants.

Procedure

Participants were tested in groups of up to eight at a time. First, participants completed the IE-4, the GCBS, and a socio-demographic survey. Afterwards, we instructed participants to read as naturally as possible and in a way that they will comprehend the message. Participants read all 96 messages in a randomized order and self-paced fashion on a computer screen. The procedure was mostly identical to Experiment 1. The only deviation was that

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[3] Profile pictures of the example items have been pixelized for trademark reasons. Participants saw the items in a non-pixelized version.

participants rated plausibility ("how would you judge the plausibility of this text?") *and*

source credibility ("how would you judge the credibility of the source (twitter account)?") of

the Twitter messages in separate counterbalanced blocks on a scale from 1 (*not plausible at*

all or *not credible at all*) to 7 (*very plausible* or *very credible*). Participants were debriefed

and reimbursed.

Results and Discussion

Similar to Experiment 1, we conducted linear mixed models to analyze reading times.

The Type I error probability was set at .05 (two-tailed) in all significance tests. Participants

and items were entered as random effects (random intercepts) in the models. The main effects

and the interaction of the contrast-coded independent variables were entered as fixed effects

in the models. Plausible messages were coded as 1 and implausible messages as -1. High-

credible sources were coded as 1 and low-credible sources as -1. The position in the

experiment and the character count of an item were entered as centered predictors in the

model. Reading times were log-transformed for analyses and contrasts were back-transformed

from their logarithmic model estimates and are reported in milliseconds. As in Experiment 1,

we estimated effect sizes (Cohen's *d*) for differences in condition means and assessed post

hoc sensitivity. To this end, we used the corresponding standardized variance components of

the linear mixed model for reading times (participants = 0.26, items = 0.08, residual = 0.65)

with 40 items and 50 participants. With a power of .90 and a Type I error probability of .05,

the model should be able to detect effects of $d = 0.087$ or higher.

Data Cleaning of Reading Times

Data from non-native speakers (11 participants; 440 data points or 15.28% of data)

and participants with less than 75% accuracy on the reading comprehension task (11

participants; 440 data points or 15.28% of data) were excluded from the analysis. Moreover,

reading times (per character) outside the interval defined by ±3 *SD* from the mean of the log-

transformed reading times were treated as outliers (nine data points, 0.31% of the data). The

final sample consisted of 50 participants with a mean accuracy of 83.25% (*SD* = 5.34%) on

the comprehension task.

Reading Times

Table 6.3 provides estimates and significance tests of the fixed effects. We expected a

main effect of plausibility with longer reading times of implausible messages compared with

plausible messages (Hypothesis 2.1). The main effect failed to reach significance, β = 0.01,

t(1923) = 1.57, p = .116. Therefore, Hypothesis 2.1 was not supported. However, the analysis

revealed an interaction effect of plausibility and source credibility, β = 0.01, t(1901) = 2.04, p

= .041 (Figure 6.6). Longer reading times emerged for implausible messages (*M* = 6,054, *SE*

= 223) compared to plausible messages (*M* = 5,747, *SE* = 212) when they came from a high-

credible source partially supporting Hypothesis 2.1, t(1917) = -2.55, p = .011, d = -0.13.

However no difference occurred in messages from a low-credible source, t(1910) = 0.33, p =

.741. Instead, plausible (*M* = 6,045, *SE* = 223) and implausible messages (*M* = 6,005, *SE* =

221) from low-credible sources were read slowly irrespective of plausibility.

Hypothesis 2.2 predicted that reading times for implausible messages from a low-

credible source should be faster compared with implausible messages from a high-credible

source. Unexpectedly, we found no difference in reading times of implausible messages stated

by high-credible (*M* = 6,054 ms, *SE* = 223 ms) compared with low-credible sources (*M* =

6,005 ms, *SE* = 221 ms), t(1903) = 0.40, p = .689. However, plausible messages coming from

high-credible sources (*M* = 5,747 ms, *SE* = 212 ms) elicited faster reading times than from

low-credible sources (*M* = 6,045 ms, *SE* = 223 ms), t(1903) = -2.48, p = .013, d = -0.13. Thus,

the pattern of the interaction was not in line with Hypothesis 2.2. It seems that low-credible

sources might have weakened the plausibility of the plausible messages during moment-by-

moment processing in a way that the sources led to lesser-perceived plausibility and thus to

slower validation processes as indicated by longer reading times. Still, the interaction is in

line with the general assumption that source credibility and plausibility jointly affect the

validation of plausible text information.

Two control variables, the item position and length, had a significant effect on reading

times. Participants read longer texts more slowly and later presented messages faster.

Figure 6.6

Mean Reading Times of Experiment 2 with ±1 Standard Error by Experimental Condition
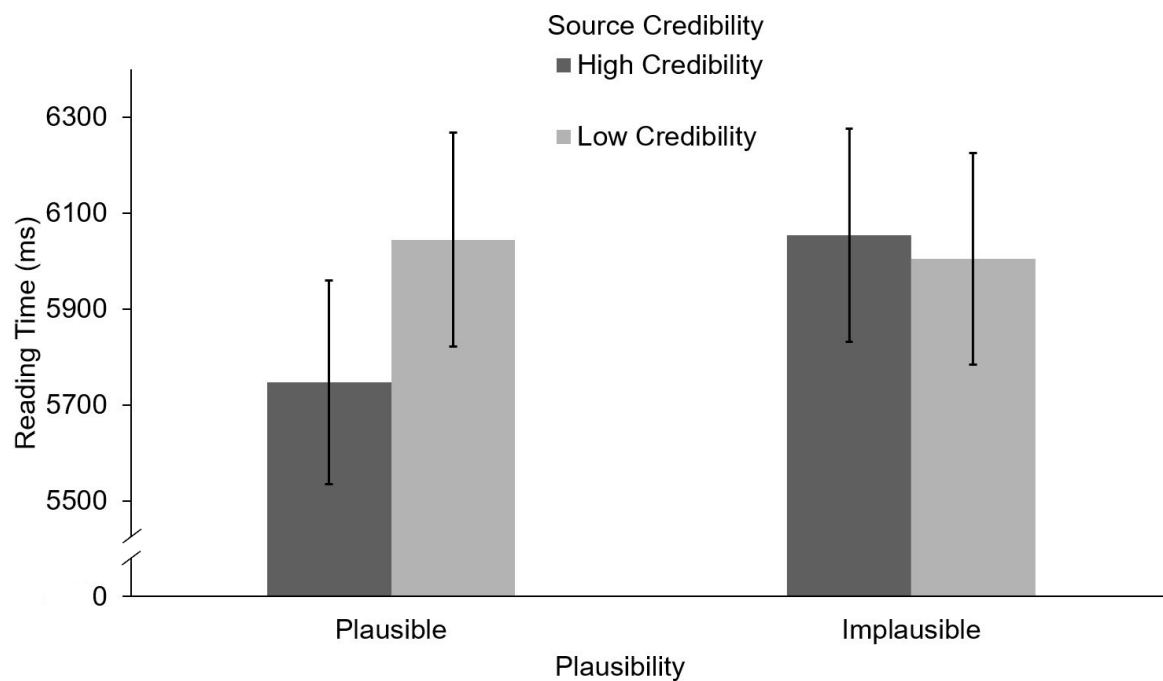
Table 6.3

Estimated Coefficients, Standard Errors, Degrees of Freedom, and t Values for the Linear

Mixed Model of the Reading Times in Experiment 2.

	Est.	*SE*	*df*	*t*	*p*
(Intercept)	8.693	0.035	74.41	250.72	< .001
Text Length	0.129	0.017	66.33	7.48	< .001
Item Position	-0.100	0.007	1910	-13.68	< .001
Source Credibility	-0.011	0.007	1904	-1.47	.142
Plausibility	0.011	0.007	1923	1.57	.116
Source Credibility x Plausibility	0.015	0.007	1901	2.04	.041

Note. Source Credibility (contrast coded: high credibility = 1, low credibility = -1).

Plausibility (contrast coded: plausible = 1, implausible = -1).

Specifications for Plausibility and Source Credibility Ratings

We conducted linear mixed models to analyze plausibility and source credibility

ratings. Model specifications were identical to those in the analysis of reading times. Data

from 71 participants was available.

Plausibility Ratings

Table 6.4 provides estimates and significance tests of the fixed effects. We expected

participants to judge plausible messages as more plausible compared with implausible

messages (Hypothesis 2.3). In support of Hypothesis 2.3, analysis revealed a large significant

main effect of plausibility on plausibility ratings, $t(2728.98) = 65.33, p < .001, d = 2.37$

(Figure 6.7). Participants rated plausible messages ($M = 5.55, SE = 0.07$) as considerably

more plausible than implausible messages ($M = 1.84, SE = 0.07$). Apparently, participants

used the texts' consistency with world knowledge as a major criterion for their plausibility

judgments.

Moreover, plausibility and source credibility were expected to interact on plausibility judgments (Hypothesis 2.4). In particular, high-credible sources were expected to increase perceived plausibility of plausible texts and to decrease perceived plausibility of implausible texts. This hypothesis was not supported, indicated by nonsignificant interaction effect, $\beta = 0.02$, $t(2727.22) = 0.81$, $p = .419$.

Instead, a significant albeit weak main effect of source credibility on plausibility ratings emerged, $t(2727.22) = 3.76$, $p < .001$, $d = 0.14$. Messages from high-credible sources ($M = 3.80$, $SE = 0.07$) led to slightly higher plausibility ratings than from low-credible sources ($M = 3.59$, $SE = 0.07$). Taken together, the findings with plausibility judgments add to the general assumption that both plausibility and source credibility are considered for validation.

Table 6.4

Estimated Coefficients, Standard Errors, Degrees of Freedom, and t Values for the Linear Mixed Model of the Plausibility Ratings in Experiment 2

	Est.	*SE*	*df*	*t*	*p*
(Intercept)	3.70	0.07	49.62	54.66	< .001
Source Credibility	0.11	0.03	2727.22	65.33	< .001
Plausibility	1.86	0.03	2728.98	3.76	< .001
Source Credibility x Plausibility	0.02	0.03	2727.22	0.81	.419

Note. Source Credibility (contrast coded: high credibility = 1, low credibility = -1).

Plausibility (contrast coded: plausible = 1, implausible = -1).

Figure 6.7

Mean Plausibility Ratings of Experiment 2 with ±1 Standard Error by Experimental

Condition
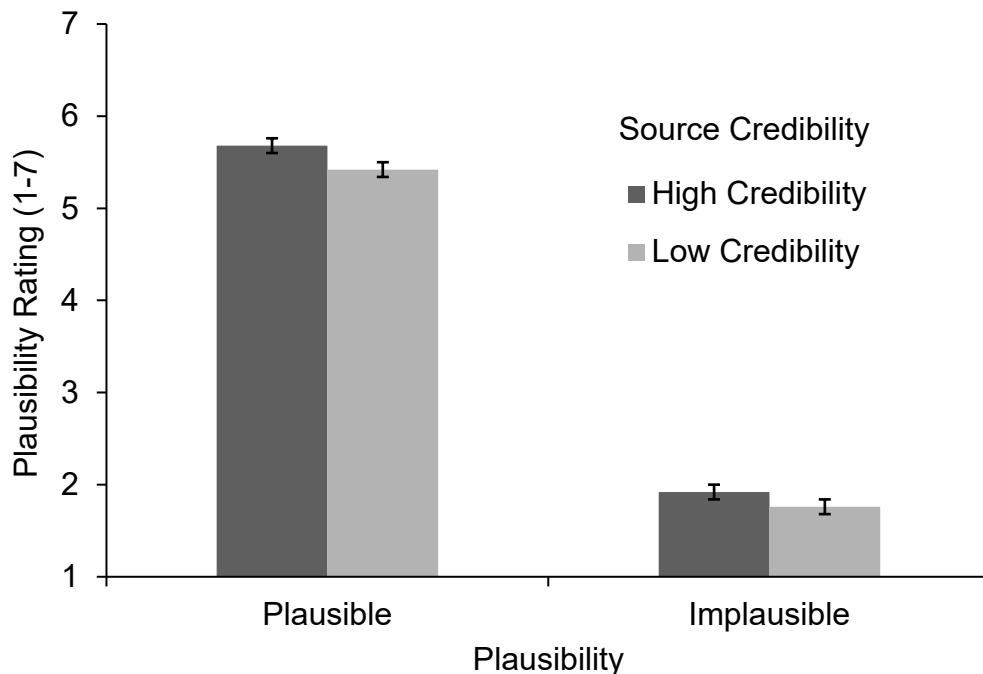
Source Credibility Ratings

A comparable pattern occurred for source credibility ratings (Figure 6.8). The main

effect of source credibility on source credibility ratings predicted by Hypothesis 2.5 emerged,

$t(2727) = 23.58$, $p < .001$, $d = 0.84$. Participants rated source credibility higher for messages

presented by high-credible sources ($M = 4.44$, $SE = 0.08$) compared with low-credible sources

($M = 2.95$, $SE = 0.08$). Hence, the manipulation of source credibility based on reputation of

media outlets was a success. Interestingly, the plausibility of the messages had an even

stronger impact on source credibility ratings, $t(2731) = 35.67$, $p < .001$, $d = 1.28$. Participants

rated source credibility higher for plausible message ($M = 4.82$, $SE = 0.08$) compared with

implausible message ($M = 2.57$, $SE = 0.08$). Again, no significant interaction effect occurred,

$\beta = 0.004$, $t(2727) = 0.14$, $p = .89$.

Figure 6.8

Mean Source Credibility Ratings of Experiment 2 with ±1 Standard Error by Experimental

Condition
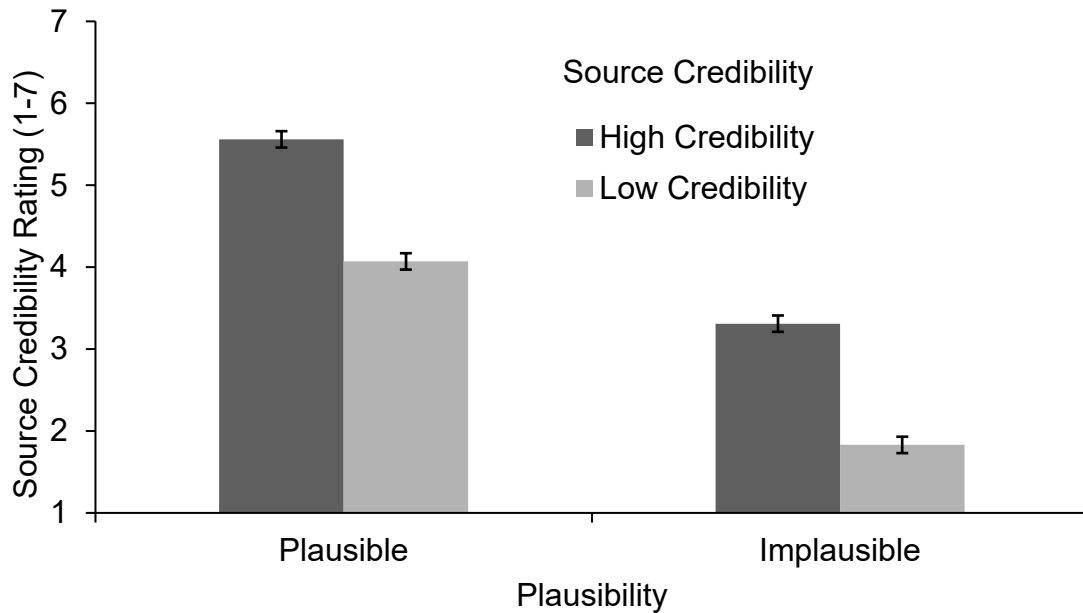
Experiment 2 examined the extent that plausibility and source credibility (i.e.,

trustworthiness) are considered in the validation of tweet-like texts. Text plausibility was

manipulated via world-knowledge consistency and source credibility was manipulated by

using media outlets with a high or low reputation. Unexpectedly, plausibility had no overall

effect on reading times but interacted with source credibility. Plausible messages were read

faster than implausible messages when these messages came from a high-credible source,

whereas messages from low-credible sources were read slowly, irrespective of their

plausibility. This interactive pattern provides partial support for Hypothesis 2.1 but differs

from the pattern predicted in Hypothesis 2.2, given that low-credible sources also slowed

down reading in messages inconsistent with world-knowledge, which is in contrast to

previous research based on narrative texts (Wertgen & Richter, 2020). In the analysis of

offline ratings, plausibility exerted a strong main effect on plausibility ratings, supporting

Hypothesis 2.3. We did not find the expected interaction of plausibility and source credibility

(Hypothesis 2.4) but instead a main effect of source credibility. Thus, participants seemed to use the reputation of the media outlets as an independent criterion for judging the plausibility of the tweet-like messages.

General Discussion

The present study examined the general assumption that plausibility and source credibility are considered in the validation of text information embedded in a social media context. In two experiments, participants read Twitter-like messages with varying plausibility and source credibility. We used reading times as an online indicator of validation and plausibility judgments as an offline indicator in both experiments (Rapp & Mensink, 2011). Overall, the present experiments elicited two informative findings.

First, we found strong plausibility effects on reading times and plausibility judgments in Experiment 1 (Hypotheses 1.1 and 1.3). Participants judged belief-consistent texts as more plausible, which is in line with research on the text-belief consistency effect (e.g., Maier et al., 2018) and broadly in line with reading-time experiments based on the inconsistency paradigm (e.g., O'Brien et al., 1998). In Experiment 2, no overall effect of plausibility occurred with reading times, a finding that diverged from the expected pattern (Hypothesis 2.1). However, an interaction effect emerged for reading times showing a plausibility effect for plausible versus implausible texts coming from high-credible sources. Likewise, a strong plausibility effect occurred for plausibility judgments in Experiment 2 (supporting Hypothesis 2.3). Taken together, the partial converging evidence across online and offline indicators of validation suggests that the texts' consistency with participants' prior beliefs and world knowledge are major criteria for validation during reading and for the explicit plausibility judgments that are fed by the implicit plausibility judgments generated by the validation process (Schroeder et al., 2008).

Second, we found important evidence for the general assumption that source credibility is also considered in the validation of tweet-like texts in both experiments and even

with different manipulations of trustworthiness. In Experiment 1, trustworthy sources raised the perceived plausibility and likewise affected reading times as implicit indicators of validation, as predicted in Hypotheses 1.2 and 1.4. Moreover, we found partial evidence for an interplay of text-belief consistency and source-message consistency on reading times and on plausibility judgments. As planned comparisons revealed, participants allocated more time to messages that contradicted their beliefs when these messages came from message-inconsistent sources compared with message-consistent sources. However, an authentic, message-consistent source led to faster reading times and increased the perceived plausibility for belief-consistent messages, suggesting that the authenticity of the source was considered for validation in belief-inconsistent and belief-consistent messages alike.

In Experiment 2, plausibility was operationalized via the consistency of information with readers' world knowledge and source credibility was operationalized via the reputation of media outlets, which captures an aspect of the trustworthiness dimension of source credibility (Pornpitakpan, 2004) that differs from Experiment 1. We expected plausibility and source credibility to interact because readers might expect plausible statements to come from reputable media sources but implausible statements to come from less reputable media sources. Such an interaction effect was partly found for reading times, which were longer for plausible messages from a low-credible source compared with a high-credible source. For plausibility judgments, the expected interaction did not occur but instead a main effect of source credibility emerged as in Experiment 1. In sum, the results from both experiments suggest that plausibility is the main criterion used for the validation of tweet-like messages and ensuing explicit plausibility judgments but that source credibility is an additional criterion—although the exact way that the two criteria are combined in validation may differ depending on the type of source credibility.

These results are broadly in line with research based on short narratives (Foy et al., 2017; Wertgen & Richter, 2020; Wertgen et al., 2021). This research suggests that source

credibility can be regarded as an important contextual information that signals to the reader whether text information conveyed by the source might be believable or not. However, the present experiments focused on the trustworthiness dimension of source credibility and not on the expertise dimension, as in the experiments by Wertgen and Richter. Whether trustworthiness and expertise differ in their potential to affect validation processes is an open question. An evaluation of expertise might be more informative for validation compared with trustworthiness when information veracity is assessed through world knowledge. Nonetheless, Foy et al. (2017) found that trustworthy sources mitigated the implausibility of unlikely (but not impossible) story events. As in Foy et al., participants in Experiment 1 might have deemed the belief-inconsistent texts as somewhat (but not completely) implausible, given their moderate prior beliefs and the relatively high plausibility ratings for the belief-inconsistent texts. For somewhat implausible information, the truth value is difficult to determine and source credibility can function as an additional criterion for validation (Wertgen et al., 2021). In Experiment 2, the plausibility manipulation was much stronger. For example, several implausible messages conveyed conspiracy theories such as the bizarre idea that the earth is flat. Readers were able to reject these grossly implausible texts without considering source credibility (similar to de Pereyra et al., 2014).

Source credibility not only affected the validation of belief-inconsistent texts, but also plausible texts in both experiments, which is at odds with recent research that used narratives to examine the role of source credibility in validation (Foy et al., 2017; Wertgen & Richter, 2020; Wertgen et al., 2021). Apparently, untrustworthy sources also disrupted the processing of plausible texts, suggesting that untrustworthy sources signaled readers to adopt a more critical stance. Moreover, although expertise and trustworthiness are the core dimensions of source credibility (Self, 2009), McCroskey and Teven (1999) argued that goodwill (i.e., the degree to which a perceiver believes a sender has his or her best interests at heart) may also play a role as a third dimension of source credibility. In our experiments, an evaluation of

goodwill might have contributed to validation of plausible messages, as the untrustworthy sources might appear as biased or partisan (Lee, 2010). For example, corporations might attempt to improve their reputation through greenwashing (de Vries et al., 2015) and the yellow press is often associated with unethical journalism (e.g., Sparks, 2000).

The source credibility effects on the processing of plausible texts are only partly in line with the D-ISC model, which distinguishes between consistent (e.g., reading plausible texts) and discrepant processing (Braasch & Kessler, 2021). Only discrepant processing is assumed to induce attention to source information because readers might try to resolve the discrepancy, whereas consistent processing should move on without disruption. The deviation from the D-ISC model might be caused by the specific operationalizations of source credibility but also by the high salience of source information in the present experiments. Research on multiple documents comprehension often focuses on readers' strategic use of source information in reading situations in which source information is easily overlooked. Hence, readers need to actively direct their attention to the source (Bråten et al., 2018). Likewise, Sparks and Rapp (2011) used text material with more distant and therefore less salient source information and found little evidence for effects of source credibility. Along the same lines, de Pereyra et al. (2014) found weaker memory for remote sources compared with closer sources. In contrast to the reading situations used in the current two experiments, source information is very salient in a social media environment like Twitter, where the name and sometimes the well-known logo of an organization is presented right above the message. Thus, the social media setting employed in the present experiments seems suitable to make source credibility more salient, which increases the likelihood that it is considered in validation.

The present experiments have a number of limitations. First, full Twitter messages were displayed, making it impossible to disentangle reading times for the message and the source information. In future experiments, the use of eye-tracking might provide a means to

assess the allocation of cognitive resources to the two types of information processing. That is, the measure could address the pressing questions of the extent that processing the source information affects subsequent processing of the message and the extent that processing of the message triggers subsequent processing of the source information. Second, reading up to 128 experimenter-made texts is a relatively artificial reading situation. Hence, using a more naturalistic paradigm might allow a more ecologically valid investigation of validation processes in real-world reading situations.

To conclude, the present study provides further evidence for the role of prior beliefs in validation during text comprehension. The present experiments provide evidence for the general assumption that plausibility and source credibility are considered in the validation of text information. Plausibility exerted the strongest and most consistent effects but source credibility also affected both the online processing of the messages and the offline plausibility judgments. Apparently, readers use salient cues to the trustworthiness of a source as signals as to whether a message may be deemed believable.

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7   General Discussion

The overall aim of this dissertation was to examine how source credibility is engaged in routine validation of text information. In Chapter 2, validation was presented as an integral part of text comprehension that complements the stages of activation and integration. Validation protects the situation model from inaccurate or inconsistent text information based on the implicit assessment of information plausibility. In addition, the role of source credibility and its strategic evaluation within (multiple) text comprehension research was summarized. However, less is known about the role of source credibility in routine and nonstrategic validation. To this end, the limited evidence on the interplay between plausibility and source credibility in routine validation was reviewed. Based on the potential importance of source credibility for text comprehension and the relationship between source credibility and the validity of information, the general assumption was justified. Source credibility serves as an additional criterion for validation processes apart from plausibility. In detail, the present dissertation argues that plausibility is the main criterion for validation, but source credibility as a specific contextual information can modulate the validation of text information.

In this Chapter, I summarize and shortly discuss the key findings of the three empirical studies. Subsequently, theoretical and practical implications obtained from the key findings are discussed. Finally, limitations and directions for future research are elaborated before a general conclusion is drawn.

7.1   Summary of Results

Summary and Discussion of Study 1

The first study (Chapter 4) examined the role of source credibility in the validation of world-knowledge consistent (i.e., highly plausible) and inconsistent (i.e., highly implausible) text information within short stories. In two experiments, plausibility judgments and reading times of target and spillover sentences as explicit and implicit indicators of validation were

analyzed. Study 1 was conceptually close to Foy et al. (2017), which was the only study at that time that directly examined joint effects of source credibility and plausibility for the validation of text information. However, the two studies differed in their operationalization of plausibility and source credibility.

In sum, two overall findings emerged. First, converging strong plausibility effects on plausibility judgments, target and spillover sentences showed that plausibility is the primary criterion for knowledge-based validation (e.g., Isberner & Richter, 2014a). World-knowledge consistent text information was granted more plausibility compared with world-knowledge inconsistent text information as indicated by higher plausibility judgments and faster reading times for world-knowledge consistent target and spillover sentences.

Second, interaction effects of plausibility and source credibility emerged with both indicators of validation, indicating a modulating role of source credibility. Plausibility judgments were higher for congruent pairs of source credibility and plausibility compared with the incongruent combination. That is, credible sources boosted the plausibility of plausible text information but increased the implausibility of highly implausible text information. Similar to Foy et al. (2017), source credibility modulated the validation of implausible text information during reading, but it apparently did not matter for the processing of plausible text information. However, the source credibility effects of Study 1 and Foy et al. diverged. In Study 1, source credibility affected the validation of implausible information, with credible sources exacerbating the implausibility of highly implausible text information as suggested by higher reading times of target and spillover sentences. In contrast, Foy et al. (2017) found an increase in perceived plausibility for somewhat implausible information by credible sources.

To conclude, source credibility modulated the validation of implausible information, but the divergent patterns between the two studies could have been caused by the different degrees of (im)plausibility. This theoretical assumption was tested directly in Study 2.

Summary and Discussion of Study 2

Study 2 (Chapter 5) tested the assumption whether the role of source credibility for validation depends on the degree of (im)plausibility of text information. To this end, Study 2 extended plausibility (i.e., world-knowledge consistency) by an intermediate level of somewhat implausible text information, which was comparable to the implausible condition of Foy et al. (2017). Otherwise, methods and analyses were the same as in Study 1.

Similar to Study 1, plausibility dominated initial knowledge-based validation as indicated by three-staged plausibility effects in convergence on both indicators of validation. Plausibility decreased from plausible to somewhat implausible to highly implausible information with slower reading times and lower plausibility judgments accordingly.

Importantly, interaction effects of source credibility and plausibility emerged on reading times of spillover sentences and plausibility judgments. Spillover sentences after somewhat implausible sentences from high-expertise sources were read faster compared with the same sentences from low-expertise sources. In contrast, spillover sentences after highly implausible sentences by high-credible sources were read slower compared with the same sentences from low-expertise sources. Similarly, plausibility judgments of plausible and highly implausible information were boosted in perceived plausibility by congruent source credibility, that is, high-credible and low-credible sources, respectively.

The results support the assumption that the effect of source credibility on validation seems to depend on the degree of (im-)plausibility. When information can readily be validated based on activated world knowledge, the relevance of source credibility is minimal. However, when information reaches a certain degree of implausibility, high-credible sources are informative for readers when validating the information, hence boosting the plausibility of somewhat implausible information. Once information implausibility increases to a certain point, the effect of high-credible sources flips, which disrupts the processing of highly implausible information by further exacerbating the implausibility. Moreover, these findings

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integrate the seemingly divergent results of Foy et al. (2017) and Study 1. Foy et al. presented improbable story events, comparable to somewhat implausible information in Study 2. However, implausible assertions in Study 1 were highly implausible, leading to a processing disruption when presented by high-credible sources compared with low-credible sources. This pattern was replicated in Study 2.

Although the findings of Study 1 and 2 make sense theoretically and jointly align with the findings of Foy and colleagues, the text material and manipulations have certain limitations. For example, source credibility was based on very explicit expertise descriptions. However, in everyday discourse situations, such as browsing social media for information, the evaluation of source credibility might depend on less explicit information (Metzger et al., 2010; Westermann et al., 2014). Study 3 tested these aspects by employing an ecological valid setting with another text genre and more real-world sources.

Summary and Discussion of Study 3

The texts of Study 1 and 2 and partly the material of other studies on the role of source credibility in validation (Braasch et al., 2012; Foy et al., 2017; Sparks & Rapp, 2011) have limited authenticity for everyday reading situations. To fill in this gap, participants in Study 3 (Chapter 6) read short Twitter messages in two experiments, mostly about societal relevant issues such as climate change or vaccination. These messages came from relatively familiar real-world sources such as Shell or ARD. Usually, source credibility is factorized along expertise and trustworthiness dimensions (e.g., Pornpitakpan, 2004). In contrast to Study 1 and 2, Study 3 investigated the extent that trustworthiness affects the validation of short Twitter messages, and plausibility was based on text-belief consistency (Experiment 1). Texts advocated a belief regarding a socioscientific debate, which was consistent (plausible) or inconsistent (implausible) with a reader's belief. Otherwise, methods and analyses of Study 3 were comparable to Study 1 and 2.

In Experiment 1, main effects of both plausibility and source credibility emerged in convergence with reading times and plausibility judgments. Participants read text-belief consistent messages faster and judged these as more plausible compared with text-belief inconsistent messages. Likewise, messages from trustworthy sources were read faster and judged as more plausible compared with untrustworthy sources. However, an interaction effect of plausibility and source credibility only occurred for plausibility judgments with a boost in plausibility for text-belief consistent messages by high-credible sources.

In Experiment 2, plausibility was manipulated via world-knowledge consistency (plausible vs. implausible messages), and sources were trustworthy versus untrustworthy media outlets. No main effect of plausibility on reading times emerged except on plausibility judgments. As in Experiment 1, plausible messages were judged as considerably more plausible. However, an interaction effect of plausibility and source credibility emerged on reading times, showing a plausibility effect for trustworthy sources. Plausible messages were read faster than implausible messages from trustworthy sources and faster than plausible messages from untrustworthy sources. Moreover, a weak main effect of source credibility appeared on plausibility judgments with higher ratings for messages by trustworthy sources.

In sum, source credibility and plausibility affected validation during reading and the explicit plausibility judgments in both experiments. Plausibility as the main criterion for validation elicited stronger and more consistent effects, but source credibility affected processing during and after reading short Twitter messages.

7.2   Theoretical Implications

Overall, the present studies yielded three major findings. The first finding adds to the large body of evidence for routine validation as a passive process in which information plausibility based on the consistency with world knowledge and prior beliefs is the primary criterion for validation (O'Brien & Cook, 2016a, 2016b; Richter, 2015; Singer, 2013, 2019).

More importantly, the present dissertation aimed at answering how source credibility and plausibility are (jointly) considered in validation during text comprehension. The second finding provides evidence for the general assumption that source credibility is considered in the validation of text information. The third finding, elucidates the second finding by providing evidence for the modulating role of source credibility for routine validation processes, which seems to depend on the (im)plausibility of an information. The following sections elaborate on these three findings.

Finding 1: Further Evidence for Validation as an Integral Part of Text Comprehension

The largely converging results between implicit and explicit indicators of validation—reading times and plausibility judgments—suggest that the primary criterion for validation is the plausibility of information or a message. Strong plausibility effects emerged in all experiments across varying plausibility manipulations (i.e., effects of world knowledge and text-belief consistency). In line with numerous experiments based on the inconsistency effect (e.g., Maier et al., 2018; O'Brien et al., 1998; Rapp, 2008) and an abundance of other experiments on the role of plausibility in comprehension (Isberner & Richter, 2014a), reading times depended on the plausibility of information, that is, processing advantages increased with increasing plausibility.

Moreover, implicit validation processes are assumed to feed into the explicit evaluation of plausibility (Schroeder et al., 2008). In line with this notion, plausibility also mattered for the explicit plausibility judgments. In all studies, strong plausibility effects emerged in convergence with reading times. Taken together, these findings provide further evidence for validation as an integral part of text comprehension that continually assesses the plausibility of information based on world knowledge and prior beliefs (Richter, 2015).

Finding 2: Source Credibility is Considered in the Validation of Text Information

The results of the three studies support the general assumption that source credibility is considered in the routine validation of text information, which is broadly in line with recent

research on the potential role of source credibility for validation (Braasch et al., 2012; Foy et al., 2017; Sparks & Rapp, 2011). Partially converging implicit and explicit measures across all studies indicate that source credibility serves as an additional criterion for validation. However, the exact influence of source credibility on validation seems to depend on the perceived plausibility of the information. Accordingly, interaction effects of plausibility and source credibility on implicit and explicit indicators of validation emerged in all studies, mostly in convergence, which suggests an interactive relationship of both criteria. Note, however, under certain conditions—as in Study 3 (reading times of Experiment 1)—the relationship may also be complementary.

Source credibility only affected reading times of somewhat implausible and highly implausible information, except for Study 3. In light of the present empirical evidence and previous studies (Braasch et al., 2012; Foy et al., 2017), source credibility has more impact on the validation of information perceived as somewhat implausible. For the explicit evaluations of plausibility, high-credible sources slightly increased the perceived plausibility of text information compared with low-credible sources in all studies, irrespective of the information's plausibility. Moreover, participants considered the fit of plausibility and source credibility for the explicit plausibility evaluations. In Study 1 and 2, high-credible sources lowered the perceived plausibility of highly implausible information, but in turn, it slightly raised the perceived plausibility of plausible information compared with the corresponding low-credible condition in all studies. In line with Lombardi et al. (2014), readers seemed to consider source credibility for the explicit evaluation of plausibility.

The first two major findings—strong plausibility effects and weaker source credibility effects—suggest that plausibility is the primary criterion for validation and that source credibility as an additional criterion can modulate validation. However, the impact of source credibility for validation seems to depend on the plausibility of the information.

Finding 3: The Role of Source Credibility in the Validation of Text Information is

Determined by the Degree of (Im-)Plausibility

The findings of Study 1 and Foy et al. (2017) in light of Study 2 strongly suggest that

the modulating role of source credibility for validation is likely to depend on the degree of

(im)plausibility. In addition, this assumption partially allows interpreting the findings of

Study 3. A helpful framework to conceptually illustrate how source credibility and

plausibility influence validation is the social judgment theory (Sherif & Sherif, 1967; Sherif et

al., 1965), which posits that belief-relevant information can occur on a continuum with

latitudes of acceptance, noncommitment, and rejection.

A similar continuum might hold for validation and the resulting (implicit) plausibility

judgments. When information is plausible it should fall into the latitude of acceptance, that is,

readers can accept the information based on the assessed high plausibility alone, mostly

irrespective of the source. However, when plausibility decreases, source credibility as an

informative cue increases in importance. Hence, when information cannot be clearly accepted

or rejected based on activated knowledge or beliefs, then source credibility becomes an

informative cue in which high-credible sources can mitigate the implausibility of somewhat

implausible information, which is comparable to the latitude of noncommitment (i.e.,

uncertainty). Once implausibility reaches a certain level, however, high-credible sources

further disrupt the validation of highly implausible information and thus exacerbate the

perceived implausibility based on the mismatch between the source credibility and the false

information.

In line with the notion of a latitude of acceptance, Study 1, Study 2, and Foy et al.

(2017) found no processing differences between plausible information from high- versus low-

credible sources. However, high-credible sources can mitigate the implausibility of

implausible information as suggested by the reading times of somewhat implausible

information in Study 2 and Foy et al. (2017, Experiment 1), which is comparable to the

latitude of noncommitment. Similarly, the processing of text-belief inconsistent information, which can be considered as somewhat implausible (see Chapter 6), was faster when it came from a high-credible source compared with a low-credible source (Study 3, Experiment 1). Once implausibility exceeds a certain point on the continuum, as was the case with the highly implausible information in Study 1 and 2, the mitigating effect of source credibility flips. High-credible sources exacerbated the implausibility of highly implausible information in Study 1 and Study 2 in convergence across implicit and explicit indicators of validation.

Moreover, certain information, such as contents of conspiracy theories, might reach a point on the continuum at which it would seem bizarre or extremely implausible. For extremely implausible information, source credibility may exert no influence on validation because the information is directly rejected, which is comparable to a latitude of rejection. Preliminary evidence for this condition might be a finding of Study 3. In Experiment 2, no substantial differences in reading times and only very little differences in the explicit plausibility judgments for such bizarrely implausible information emerged, irrespective of source credibility (similar to de Pereyra et al., 2014). Note, however, that this last interpretation is mostly speculative at this point. Research is needed that systematically compares more levels of (im)plausibility to investigate this assumption.

Contextual Information versus World Knowledge Contributions for Validation and Further Implications for the RI-Val Model

The present findings are informative for the debate on how contextual information and world knowledge contribute to fundamental processes of comprehension—an issue highlighted in the RI-Val model (e.g., O'Brien & Cook, 2016a, 2016b). A growing body of research suggests that activated world knowledge often dominates validation as the primary criterion and (strong) contextual information has an inferior role but can also affect validation (e.g., Cook & Guéraud, 2005; Cook & Myers, 2004; Garrod & Terras, 2000; William et al., 2018). Source credibility can be seen as a specific type of contextual information. In line with

this research, strong plausibility effects appeared and also weaker (simple) effects of source credibility emerged throughout all three studies and with implicit and explicit indicators. Moreover, the temporal pattern of the reading-time effects is interpretable within this general debate over the dominance of world knowledge against contextual information. Recent research highlights the importance of both but suggests more relative importance for knowledge-based validation as indicated by stronger and earlier disruptions caused by world-knowledge inconsistencies compared with contextual inconsistencies (van Moort et al., 2018, 2020, 2021). Similarly, the temporal pattern of Study 2, with initial and strong effects of plausibility and weaker and delayed effects (i.e., spillover effects) of source credibility, complements these findings and the importance of world knowledge in initial validation.

Moreover, the RI-Val model posits that the validation stage is unrestricted and runs to completion (see Chapter 2.2.1). Based on these critical assumptions, source credibility and plausibility can influence validation, which can exert effects even after readers have met their coherence threshold and moved on to the subsequent sentence (i.e., spillover sentence). Therefore, the joint impact of plausibility and source credibility observed with differences in reading times on the spillover sentences in Study 1 and 2, which were identical across conditions, is consistent with these critical assumptions of the RI-Val model, showing a continual influence of validation on processing (e.g., Cook & O'Brien, 2014).

Validation and Source Information in Light of the D-ISC Model

The D-ISC model posits how processing of conflicting or contradictory messages from different sources may trigger the strategic use of source information (Braasch & Bråten, 2017; Braasch & Kessler, 2021; see Chapter 2.3.2). Particularly, the model distinguishes between consistent and discrepant processing. In discrepant processing, a detected discrepancy or inconsistency may induce the strategic processing and evaluation of source information that may resolve the discrepancy. In Study 1 and Study 2, source credibility effects during reading emerged only in the presence of a discrepancy, that is, an inconsistency with world-

knowledge of varying implausibility. These findings are in line with the central assumption of the D-ISC model. Hence, the result patterns of Study 1 and 2 could be interpreted as instances of consistent (i.e., processing of plausible information) and discrepant processing (i.e., processing of implausible information). Note however, that Study 1 and 2 used self-paced reading (moving window) to assess online processing. Hence, participants could not regress to the source descriptions as discrepant processing within the D-ISC model would imply, making this interpretation speculative to some extent.

Explorative and Unexpected Findings of the Present Dissertation

A general explorative finding is that the relationship between source credibility and plausibility may be more bi-directional as commonly assumed. In line with this reciprocity between the message plausibility and the credibility of the source providing a message (Slater & Rouner, 1996), source credibility effects on plausibility judgments and plausibility effects on source credibility judgments emerged across all studies. However, the effects of source credibility on plausibility judgments were consistently smaller than the inverse effects, that is, the effects of plausibility on source credibility. Moreover, even plausibility effects on source credibility ratings were larger than source credibility effects on source credibility ratings. Apparently, participants used relevant world knowledge and the consistency with their beliefs not only to validate the messages but also to evaluate the source credibility of a message. These findings can be regarded as a case in point for the general roles of plausibility and source credibility in which the plausibility seems to dominate the explicit evaluation of plausibility and source credibility.

In contrast to Study 1 and 2 and to recent findings (e.g., Braasch et al., 2012; Foy et al., 2017), source credibility unexpectedly also affected processing of plausible text information in an ecologically valid setting (social media context of Study 3). Plausible Twitter messages from trustworthy sources elicited faster reading times compared with the same messages from untrustworthy sources in both experiments. This result is somewhat

surprising as theoretical accounts often emphasize the relevance of conflicts or inconsistencies within or between (text) information that may prompt or permit an (strategic) evaluation of source credibility to affect processing (Bråten & Braasch, 2018). This includes, for example, the DMF (Britt et al., 1999; Perfetti et al., 1999), the D-ISC model (Braasch & Kessler, 2021), the Two-Step Model of Validation (Richter & Maier, 2017) and the Content-Source Integration Model (Stadtler & Bromme, 2014). Similarly, recent research on the role of source credibility for validation argued that readers might overlook source credibility in the processing of plausible information close to the endpoint of the plausibility continuum because source information might not additionally corroborate plausibility (Foy et al., 2017; Lombardi et al., 2014; Sparks & Rapp, 2011).

However, given the findings of Study 3, theorizing ways and exploring conditions in which source credibility is considered in the validation of plausible information seems reasonable. The assumption introduced above of how source credibility depends on the implausibility of information based on a framework with latitudes of acceptance, noncommitment and rejection might help to explain possible effects of source credibility directed at the different end of the continuum, that is, on plausible information. For somewhat implausible information, the truth-value is difficult to assess, which would fall in a latitude of noncommitment (see Chapter 5). Within the latitude of noncommitment, a high-credible source corroborates the plausibility of text information or message as an informative cue. A likely explanation is that complementary somewhat plausible information might also profit from source credibility cues, which should permit high- and low-credible sources to exacerbate or mitigate the plausibility, respectively. In line with the plausibility operationalization based on world-knowledge consistency, the somewhat plausible information could be, for example, world-knowledge consistent but less well known to many people. For example, stating that Canberra is the capital of Australia might seem plausible, given that Canberra is a city in Australia but only to some extent because Sydney or

Melbourne presumably are more accessible in memory. However, perceiving the plausible information in Study 3 as somewhat plausible seems unlikely, given the relatively strong operationalizations of plausibility and the related high plausibility ratings of plausible messages (for a possible interpretation, see Chapter 6).

Again, it seems fruitful for future research to explore whether the mitigating and exacerbating effects of source credibility can be expanded on different points along the plausibility continuum and at which thresholds they vanish. Such a finding would promote the theoretical understanding of the relationship of plausibility and source credibility for the routine validation of text information.

7.3   Practical Implications

Understanding the role of source credibility for routine validation of text information is informative for validation theories, but it might also have practical implications for strategies to counteract inconsistent or false information in web-based discourse. Implications from findings are important because the prevalence of text information considered as misinformation on the Internet is a political, educational, and societal challenge (Scheufele & Krause, 2019; Williamson, 2016). Likewise, the current era has been labeled as the "post-truth era" (Lewandowsky et al., 2017) or "the era of fake news" (Albright, 2017). Social media networks like Twitter seem to play an important role in the prevalence of such misinformation (Vosoughi et al., 2018). The implausible Twitter messages of Study 3 contained central aspects of misinformation or "fake news" because they were inaccurate or partisan messages by media outlets, organizations, and companies (e.g., Tandoc et al., 2017).

A practical implication from Study 3 is that under certain conditions readers routinely use the source's trustworthiness as a cue to judge whether a message from a social media network should be considered believable. Thus, approaches to counteract the effects of online misinformation that includes source information may be prolific. Similar to the idea of source credibility as a believability cue for readers, Pennycook and Rand (2019) argued for an

approach based on trustworthiness ratings of news sources obtained from social media users. These ratings can serve as a cue to decide which information from which source the algorithm should preferentially display. The authors' intention is that the spread of misinformation and fake news on social media could be reduced with such a mechanism based on a rating system. However, Study 3 consisted of only two experiments that took place in a controlled setting, as opposed to, for example, someone browsing social media in a real-world situation. This limitation, among other limitations, restricts the applicability of this practical implication.

One challenge associated with the prevalence of false information is the continuing influence that misinformation exerts on readers and learners, often summarized as misinformation effects (e.g., Braasch & Graesser, 2020; Chrobak & Zaragoza, 2013; Ecker et al., 2022; Rapp & Braasch, 2014). Readers learn from news or expository texts but also from fictional narratives (e.g., Appel & Richter, 2007), even though the texts are not necessarily written with the intention to inform or educate. Within misinformation research, readers have been shown to store false information embedded in fictional narratives, even when the information contradicts better knowledge (e.g., Marsh & Fazio, 2006; Marsh et al., 2003; Mullet et al., 2014; Rapp, 2008). However, validation processes are assumed to routinely detect and reject such inaccuracies and therefore should prevent misinformation effects to some extent. Nonetheless, validation processes are far from perfect, and these incidents might be examples in which validation has failed (Isberner & Richter, 2014a; Singer, 2019).

The present findings with narratives suggest that source credibility can modulate the validation of information that readers cannot clearly reject or accept. Against this background, source credibility might modulate the misinformation effect via validation as well. For example, a high-credible source in a narrative might exacerbate misinformation effects compared with a low-credible source. This possibility, interesting as it may be, is rather speculative at this point. Systematic research is needed that explores this assumption with longer narratives and plausible inaccuracies (similar to Hinze et al., 2014).

7.4   Limitations and Directions for Future Research

The present research has a number of limitations, some of which were addressed in the corresponding chapters of the studies. However, limitations are the starting point for future research and are summarized in the following sections.

Limitations of the Experimental Design and Methodological Approach

The present studies followed a common methodological two-fold approach of online and offline measures (Rapp & Mensink, 2011). Reading times were used as online and plausibility judgments as explicit indicators of validation. The present findings are informative for theories of validation and text comprehension, which partly align with the temporal assumptions of the RI-Val model (O'Brien & Cook, 2016a, 2016b). However, the method of self-paced reading to elucidate moment-by-moment processing has certain restrictions (e.g., Haberlandt, 1994; Kaakinen, 2017; see, however, Chung-Fat-Yim et al., 2017). For example, readers cannot return to earlier text information. Employing eye-tracking measures with the present text material would be a fruitful way to shed more light on the exact time course of the processing. This approach could be informative in particular for the assumptions of strategic processing and evaluation of source information induced by routine validation in light of the Two-Step Model of Validation (e.g., Richter & Maier, 2017) and the D-ISC model (e.g., Braasch & Kessler, 2021).

Another limitation of reading times is that they are ambiguous to some degree, given that this type of data resembles the processing effort, not what exactly causes it (e.g., Foy et al., 2022). Even though common confounding variables that may blur reading times have been controlled, another worthwhile extension of the present studies would be to adapt a probe task, for example, conceptually comparable to Cook and O'Brien (2014), to test whether readers (re)activate the critical source information when validating the targeted information. If readers process in this manner, then the reaction time to the probe should vary as a function of plausibility and the consistency of the probe and the critical source

information. Such a result pattern would provide strong evidence for the modulating effect of source credibility on the validation as indicated by the reading-time findings of Study 1 and 2. The ultimate aim of these two methodological extensions—employing eye tracking methodology and a probe task—would be to further disentangle the underlying processes of validation.

Limitations of the Text Material and Manipulations of Plausibility and Source Credibility

All studies were based on multiple experimenter-made short texts, which vary slightly in certain aspects. Participants read short narratives or Twitter messages. Thus, the texts were limited in length and genre. Previous research on validation has focused on how narratives, as a broader discourse context, shape validation (Filik & Leuthold, 2008; Foy & Gerrig, 2014; Foy et al., 2022; Rapp et al., 2014; Walsh et al., 2018), but less research has investigated effects of other text genres.

For the present research aim, elucidating the extent that readers vary in their use of source credibility cues for validation depending on the text genre could be relevant. Readers approach the same text differently depending on whether the text is introduced as a fictional narrative or a newspaper article (e.g., Zwaan, 1994), which could also affect how readers use plausibility and source credibility in validation. Comparable to Zwaan (1994), one way to investigate genre expectation effects on the interplay of source credibility and plausibility for validation is to present the same text as fact or fiction, for example, labeled as either a newspaper article or a fictional narrative.

Strong operationalizations of plausibility were employed either via world-knowledge or via text-belief consistency. Most studies in the present research context focused on two contrasting levels of plausibility (Study 1 and 3; Braasch et al., 2012; Foy et al., 2017; Sparks & Rapp, 2011). Study 2 extended the plausibility manipulation by one intermediate level. As already insinuated before, further levels of plausibility that resemble more points on the

continuum are necessary to augment the understanding of source credibility and plausibility interaction effects on validation processes.

To my knowledge, Experiment 1 of Study 3 was the only experiment to date that directly examined joint effects of source credibility and text-belief consistency on routine validation. Experiments with texts that gradually vary in the consistency with readers' beliefs, similar to the varying levels of world-knowledge consistency in Study 2, are needed to further explore how source credibility is considered in the validation of texts conveying a belief.

Source credibility was based on the two core dimensions of source credibility: Expertise and trustworthiness (e.g., Pornpitakpan, 2004). Source credibility ratings were assessed in most studies and in all corresponding norming studies. The manipulations of source credibility can be seen as successful because sources intended as high-credible sources led to higher source credibility ratings compared to sources intended as low-credible sources across all operationalizations (i.e., expertise descriptions, source-message-consistency, or media credibility). However, source credibility is a complex construct and other aspects of source information could also affect validation (e.g., Self, 2009) such as goodwill (e.g., McCroskey & Teven, 1999; see Chapter 6). Systematic research on differential effects of multiple source-credibility dimensions could shed light on this complexity.

The source credibility manipulation was also based on two strong levels of high and low credibility. Similar to more levels of plausibility, it seems fruitful to also adapt more levels of source credibility. In association with the strong manipulations of source credibility is the salience of source information, which is another important and likely boundary condition to affect validation processes. In the present studies, the source information was highly salient because it was close to the critical information or even complemented by a corresponding profile picture (Study 3) in comparison with previous research (e.g., Sparks & Rapp, 2011). Future research should systematically examine how gradual variations of source

salience shape the modulating effect of source credibility on the validation of text information (comparable to de Pereyra et al., 2014; Kammerer et al., 2016).

Source Credibility in Validation from a Developmental Perspective and Differential Aspects

In general, the sample of participants was limited because participants were mostly young adults enrolled as university students. Student samples might have facilitated the comparison and integration of the present results across the three studies, they still lower the generalizability of the findings. Hence, one potential direction for future research is to compare the role of source credibility for the validation of linguistic information from a developmental perspective, for example, comparing children to adults. Previous research based on the epistemic Stroop paradigm shows that children around the age of 10 already routinely validate incoming audiovisual information (Piest et al., 2018). From various perspectives (e.g., cultural and evolutionary) researchers have argued that even young children already need to have means to decide what and whom to believe (e.g., Harris, 2012; Mills, 2013; Sperber et al., 2010). For example, Harris (2012) proposed that children rely on two interdependent heuristics—trustworthiness of the source and monitoring the information accuracy—to evaluate (new) information (e.g., Corriveau & Harris, 2009; Harris, 2007; Koenig & Harris, 2007). These heuristics stem from a much broader research context than the present operationalizations of source credibility and plausibility, but they still share overlap. That is, trustworthiness is a dimension of source credibility (Pornpitakpan, 2004) and the monitoring of information accuracy resembles quite closely the concept of validation as an epistemic gatekeeper or a set of cognitive mechanisms for epistemic vigilance (Richter, 2015; Sperber et al., 2010). Against this background, a fruitful exploration would be to investigate whether younger age groups make use of source credibility cues for routine validation of linguistic information and investigate the role that source credibility and information plausibility might play.

The relationship between source credibility and plausibility for routine validation may also depend on other individual differences (Anmarkrud et al., 2021). For example, research suggests that epistemic thinking (e.g., understanding epistemic perspectives) may moderate how readers integrate source information and conflicts between multiple texts (Barzilai & Zohar, 2012; Barzilai & Eshet-Alkalai, 2015; Bråten et al., 2011; Ferguson et al., 2012). Strømsø et al. (2008) found that topic-specific epistemological beliefs are involved in the comprehension of multiple conflicting texts on climate change. As such, a reader's epistemic thinking and epistemological beliefs, for example, a conception of how knowledge is developed (e.g., Clarebout et al., 2001), might reveal differential aspects that shape how source information and plausibility are integrated when processing text information.

7.5 Conclusion

The aim of this dissertation was to investigate the role of source credibility in validation processes during text comprehension. In particular, the present studies examined how source credibility and plausibility are jointly used to routinely validate incoming text information. Moreover, this relationship was scrutinized in an applied context that partly resembled everyday discourse. Across two text types and across various manipulations of plausibility and source credibility, three informative insights emerged.

First, the present studies consistently extend the evidence for validation as an important mechanism to perpetuate coherent mental representations of text information (O'Brien & Cook, 2016a, 2016b; Richter, 2015; Singer, 2013, 2019). The findings add to a large body of evidence showing a dominating role of plausibility as the primary criterion for routine validation and the explicit evaluation of plausibility based on activated world knowledge and prior beliefs (e.g., Isberner & Richter, 2014a).

Second, the present studies expand the evidence of studies investigating possible influencing conditions of validation by establishing source credibility as a specific contextual information that serves as a criterion for validation. Readers used source credibility cues

based on an evaluation of expertise or trustworthiness that modulated the implicit and explicit validation of text information with varying consistency of world knowledge, which is broadly in line with and expands the limited recent research (Foy et al., 2017; Lombardi et al., 2014; Sparks & Rapp, 2011). However, validation draws also on activated prior beliefs of a reader (Richter, 2015). The present findings provide preliminary evidence for the potential role of source credibility in the validation of texts that vary in the consistency of the conveyed belief and a reader's belief.

Third and most importantly, the extent to which source credibility affects validation seems to depend on the outcome of initial validation processes based on activated world knowledge that determine the degree of (im-)plausibility. A similar assumption might hold for the validation of texts varying in beliefs, but future research based on texts conveying gradually varying belief strength is needed.

The present studies open up directions for future research that could investigate likely boundary conditions and additional factors that influence the relationship between source credibility and plausibility in the routine validation processes of text information such as the salience of the source information or employing a developmental research perspective. Moreover, future research using paradigms such as eye-tracking would help to disentangle the underlying cognitive processes. A particularly important question is when and how an evaluation of source information affects routine validation and when the relation is inverse.

On a more general level and from my point of view, the present dissertation also implies that the reader's evaluation of source information should be considered in the theoretical toolbox of modern models for discourse comprehension as already initiated by the D-ISC model (e.g., Braasch & Kessler, 2021) and the Two-Step Model of Validation (e.g., Richter & Maier, 2017). To put it differently, "no model of discourse comprehension would be comprehensive without considering the role of sourcing" (Bråten et al., 2018, p. 157).

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Appendix

The experimental text materials, relevant data sets, the according analyses and more supplemental material of the three empirical studies included are available in an online repository at the Open Science Framework (accessible via https://osf.io/j6bn2/?view_only=c0787503874a4d8a88bc3b5279556a68). In the corresponding repository, the folder structure is as follows.

Appendix A: Material for Study 1

Experimental and Filler Texts of Experiment 1 (and Experiment 2)

Data Sets and Analyses of Experiment 1 and 2

Supplemental Material, Additional Analyses and Data Sets

Appendix B: Material for Study 2

Experimental and Filler Texts

Data Sets and Analyses

Supplemental Material, Additional Analyses and Data Sets

Appendix C: Material for Study 3

Experiment 1

Experimental and Filler Items

Data Sets and Analyses

Supplemental Material

Experiment 2

Experimental Items

Data Sets and Analyses

Supplemental Material

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