What Belongs in a Fictional World?

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Abstract
How do readers create representations of fictional worlds from texts? We hypothesize that readers use the real world as a starting point and investigate how much and which types of real-world information is imported into a given fictional world. We presented subjects (*N*=52) with three stories and asked them to judge whether real world facts held true in the story world. Subjects' responses indicated that they imported many facts into fiction, though what exactly is imported depends on two main variables: (1) the distance that a narrative world lies from reality and (2) the types of fact being imported. Facts that are true of the real world are more likely to be imported into worlds that are more similar to the real world, and facts that are more central to the representation of the real world are more likely to be imported overall. These results indicate that subjects make nuanced inferences when creating fictional worlds, basing their representations both on how different a story world is from the real world and on what they know to be causally central to the real world.

All stories are necessarily incomplete. For example, the Sherlock Holmes stories never fully describe Holmes' appearance or anatomy. Yet it would absurd to assume that Holmes can walk through walls, lacks a lung, or digests food through his circulatory system just because the stories have left these matters unspecified. Readers of the Holmes stories automatically assume that he is solid, has two lungs, and has a functioning digestive system even though there is not enough explicit information in the text to draw these conclusions. Instead, readers use information that is provided in the text (Holmes is human) combined with real-world knowledge (humans have two lungs) to draw the appropriate conclusion (Holmes has two lungs).

This example illustrates the fact that readers bring their knowledge of reality to bear when representing fictional situations, and several previous studies support this conclusion. In one, subjects read a passage about a stereotypically male or female character (e.g., football player or nurse), although the gender of the character was not explicitly mentioned. Later in the story, this character was then shown to be of the expected or unexpected sex by use of a pronoun. Subjects reading the passage in which there was a violation of stereotypical gender roles took longer to read the passage than subjects who read the passage without a violation. The researchers concluded that subjects must have chosen a gender for the main character despite the absence of explicit gender information (Carreiras *et al.*, 1996). This demonstrates that story representations are created by making inferences about the world of the story based on what would likely be the case in the real world.

Additional evidence for this point comes from a series of studies by Thomas Ward and his colleagues (Ward, 1994; Ward and Sifonis, 1997; Brédart *et al.*, 1998), who found that the real world tends to constrain creative imagination. For example, Ward (1994) asked college students to draw aliens from planets elsewhere in the galaxy. Despite prompts to make wildly imaginative creatures, the vast majority of the drawings preserved the main features of animals found on earth, including bilateral symmetry and the presence of sensory appendages such as eyes. Even more strikingly, when prompted to draw creatures that had feathers, participants tended to also add wings and beaks, preserving the co-occurrence of features seen in real-world creatures. In support of these findings, Kelly and Keil (1985) found that the mythical creatures from Ovid's *Metamorphoses* and Grimm's fairy tales also tended to preserve natural structures found in the real world, even though these are ostensibly fantastical tales.

These studies suggest that adults use their knowledge of the real world to construct representations of fictional worlds. But how much of the real world belongs in any given fictional world? One possible answer to this question is that everything about reality is true in fiction unless it is explicitly forbidden by the text. This process of representing story worlds is known as the Principle of Minimal Departure (Ryan, 1980; see also Lewis, 1978; Walton, 1990), and it requires that the worlds of fictional stories be as similar to the real world as possible while still being able to support the events in the story. Although this principle seems intuitive, there are many cases in which things that are true in the real world are not true in a fictional world, even if the text does not explicitly forbid them. For example, there is probably not a series of fictional books in Gotham City called "The Adventures of Batman", nor should there be James Bond movies available to rent in James Bond's fictional world, even

though these books and movies exist in reality (see Skolnick and Bloom, 2006). Perhaps more vividly, if the Principle of Minimal Departure held true, viewers of Western movies should assume that the hero should be just as gravely injured from a bullet wound as the villain, and that wearing a black hat is not a good cue to one's moral status. But in the case of a Western, these are the wrong answers. The hero can survive injuries that would be fatal to the villain, and only bad guys wear black hats. Yet none of these facts is mentioned explicitly in their respective texts, nor can they be deduced directly from the texts.

The Principle of Minimal Departure, then, is too strong to capture our intuitions about which real-world facts are imported into which stories. But there must be some rules or principles that govern how readers integrate real-world knowledge with fictional information, otherwise people could have radically different ideas about what belongs in a given fictional world. The current study investigates two candidate principles: Distance and Fact Type.

Perhaps the most crucial clue to how much of reality belongs in a story is the story world's distance from reality, or how similar the world is to the real world (see Gerrig, 1993). Fictional worlds that are more similar to the real world, or closer in possibility space, should by definition contain more facts that are true of the real world. Fictional worlds that are more distant in possibility space should contain fewer facts.

A secondary variable to consider is the type of fact that readers are asked to import from reality into fiction. It is possible that readers take a "checklist" approach in these importations, noting which facts are explicitly mentioned in the story and modifying these alone, while letting all other aspects of the fictional world rely on the real world. This is the strongest possible method of importation, in which all that matters is what is explicitly mentioned in the story, and in which facts of all types are treated in the same way. A second possibility is that readers change their importation strategies based on the type of fact. Facts about mathematics, for example, might be more likely than other types of facts to remain the same in fiction as in reality. If this is the case, then different categories of facts will be treated differently as people decide whether these facts are true in a fictional world.

The current study investigates these two candidate principles by asking participants to judge what is true within a given fictional world. We first tested the basic hypothesis that fictional worlds are based on the real world. Assuming that some real-world facts are imported into fictional worlds, we additionally investigated how many of these facts are imported, and which ones. We hypothesized that this importation depends primarily on how similar the fictional world is to reality (Distance) and also on what type of fact is being imported (Fact Type).

Methods

Subjects

Fifty-two adults (25 female; mean age 20.01, range 18–22) were recruited via e-mail to participate in this study. They received no compensation for their participation.

Materials

We wrote three stories which differed in their similarity to reality. All three had the same basic framework: a boy and his dog went to a petting zoo and then saved another boy's kite from flying away. In the Close story, there were no explicit violations of reality; the story could easily have been true. In the Middle story, the boy had some of the characteristics of a superhero: He wore a cape, was resistant to pain, and could fly. In the Far story, the boy could additionally teleport and change into animals, his dog could speak to him, and there were aliens in the petting zoo.

We also created a list of 21 facts that were all true in reality. There were nine Violated facts, which were explicitly contradicted by the events in the Middle and/or the Far stories. The other twelve facts fell into four categories: Contingent (e.g., "Washington, DC, is the capital of the United States"), Conventional (e.g., "It is considered rude to pick one's nose"), Scientific (e.g., "People have hearts"), and Mathematical (e.g., "two plus two equals four"). Crucially, these twelve test facts were not mentioned in any of the stories and had no bearing on any of the events or characters in the stories.

Procedure

Participants were tested using an online survey. All participants read each of the three stories, counterbalanced for order. After reading each story, participants were presented with the 21 facts and asked whether "you believe these statements are true of the world described in the story you have just read." Ratings were made on a four-point scale (definitely true, probably true, probably not true, definitely not true). The facts were presented in a random order for each participant and each story. After rating the facts, participants were asked to judge on the same scale whether "the events in this story could happen in reality."

Results

Participants' scores were coded 1, 0.5, –0.5 and –1, corresponding to answers of "definitely true", "probably true", "probably not true" and "definitely not true" respectively (see Fig. 1).
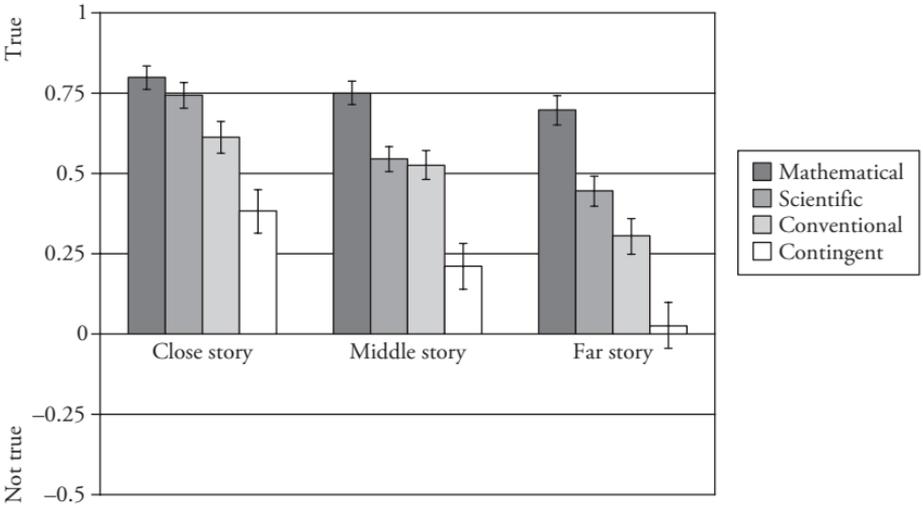
Figure 1. Average ratings of facts, split by Distance and Fact Type.

We found no effect of age, gender, field of study, or order of story presentation, so these variables were excluded from further analysis.

Violated Facts

We predicted that the facts that were explicitly violated in a story would be rated as not true (highly negative) for that story. Indeed, facts that were explicitly contradicted in the Middle story (M=−0.41, SD=0.44) were rated more negatively than facts that were not explicitly contradicted (M=0.45, SD=0.29; t_{51}=−14.9, P<0.01). The same was true in the Far story, in which explicitly contradicted facts (M=−0.55, SD=0.40) were rated as less likely to be true in the story world than facts not contradicted in the story (M=0.25, SD=0.32; t_{51}=−15.8, P<0.01).

Are Story Worlds Based on Reality?

If story worlds are based on reality, we would expect that the test facts, which were never mentioned in any of the stories, would generally be judged as true (receive positive ratings). Confirming this hypothesis, overall ratings for the facts were significantly above chance (M=0.50, SD=0.25, t_{51}=14.3, P<0.01). Additionally, collapsing the data from all the facts within each story reveals that ratings for all three stories were significantly above chance (all P<0.01), as were ratings of all four fact types collapsed over story (all P<0.01).

Effects of Story Distance and Fact Type

We tested the average ratings for the twelve non-violated facts in a 3 (story distance: Close, Middle, Far)×4 (fact type: Mathematical, Scientific, Conventional, Contingent) ANOVA. This analysis found a main effect of story distance ($F(2)=43.0$, $P<0.01$), a main effect of fact type ($F(3)=47.4$, $P<0.01$), and a significant interaction effect ($F(6)=6.0$, $P<0.01$).

Post-hoc examination of the story distance effect shows that subjects judged facts in the Close story ($M=0.63$, SD=0.27) as significantly more likely to be true than facts in the Middle story ($M=0.51$, SD=0.27; $t_{51}=5.0$, $P<0.01$), which were in turn significantly more likely to be true than facts in the Far story ($M=0.37$, SD=0.30; $t_{51}=5.2$, $P<0.01$).

Post-hoc examination of the fact type effect revealed a similar stair-step pattern of responses. Contingent facts were judged as least likely to hold true across stories ($M=0.21$, SD=0.45), with conventional facts significantly more likely to hold true ($M=0.48$, SD=0.31; $t_{51}=6.5$, $P<0.01$), scientific facts significantly more likely than conventional facts ($M=0.58$, SD=0.25; $t_{51}=3.01$, $P<0.01$), and mathematical facts significantly more likely than scientific facts ($M=0.75$, SD=0.25; $t_{51}=5.04$, $P<0.01$).

The interaction effect occurs because slightly different relationships obtain between the different fact types in each story. In the Close story, mathematical facts are rated in the same way as scientific facts, which are significantly more positive than conventional facts, which are in turn significantly more positive than contingent facts (Mathematical=Scientific>Conventional>Contingent). In the Middle story, mathematical facts are significantly more positive than scientific facts, which are rated in the same way as conventional facts, which are significantly more positive than contingent facts (Mathematical>Scientific= Conventional>Contingent). Finally, in the Far story, each interval between judgments of the four facts is significant (Mathematical>Scientific>Conventional>Contingent).

Reality Judgments

Participants were asked to judge whether the story they had read could happen in reality, and their responses on a four-point scale were coded as 0 (definitely not), 0.25 (probably not), 0.75 (probably) and 1 (definitely). A one-way ANOVA on the average score by story was significant ($F(2)=445.4$, $P<0.01$), indicating that the Close story ($M=0.92$, SD=0.17) was significantly more likely to occur in reality than the Middle story ($M=0.11$, SD=0.19), which was in turn significantly more likely to occur in reality than the Far story ($M=0.03$, SD=0.15).

Discussion

The two aims of this study were to determine whether fictional worlds are generally based on reality and, if so, to examine some of the principles that might govern which real-world truths are imported into fictional worlds. As predicted, adults' responses indicated that facts that hold true in reality generally also hold true in fiction, even in stories that are very different from reality.

Having confirmed that reality forms the basis for fiction, we examined the rules that people use when importing real-world facts into a fictional world. One possibility is that fictional worlds resemble the real world as closely as possible. This hypothesis predicts that all real-world facts that are not explicitly violated in the story should be imported into the story's fictional world. An alternative hypothesis is that people use a variety of rules to guide their judgments, inferring what is true in a given story based on more than just a checklist of explicitly violated facts. Our results support this latter hypothesis and offer evidence for two rules that people use when deciding which facts to import into a story world.

First, people are attuned to the distance that a story world lies from reality: Real-world facts are less likely to be imported into stories that are seen as very different from reality. Second, people make distinctions between groups of facts, such that some facts are seen as holding true across many story worlds (e.g., mathematical facts) and other facts are less likely to be imported into any story (e.g., contingent facts). We additionally found an interaction between these variables of story distance and fact type, indicating that adults are differentially sensitive to the facts they are asked to import depending on the type of story they are reading.

Taken together, these two results suggest that determining what is true in a story world is not as simple as examining the statements in the story and figuring out what can be directly deduced from them, and is certainly not as simple as changing the truth values of a few isolated statements while leaving the rest intact. Instead, subjects created a much more nuanced representation of the worlds that we described in order to answer questions about those worlds.

In this study, we specifically asked participants to judge facts that were not mentioned in the story because we wanted to see how the minimal information provided in the story would affect their representation of the rest of the story world. But some might argue that such facts have no truth value in the story world and that they simply remain unspecified (see Lewis, 1978; Eco, 1990). This is unlikely to be the case, because our data shows that people do

have intuitions about these unspecified facts and can respond appropriately to them based on the type of story they have read. However, our subjects made their judgments off-line, following their reading of the story, which gave them time to reflect on whether or not a given fact was true in the story world. Online measures, such as eye-tracking or response time, could help to determine how much information is contained in a story world as it is actively being constructed from the text. It is possible that the kinds of facts that we asked our subjects about, facts that had no bearing on the stories themselves, are not represented while people are reading a story and hence do lack truth values during the reading process.

Such measures can also help to draw further parallels between representing fiction and representing reality. Consider that navigating the everyday world requires only a subset of everything that we know to be true in reality; the fact that the Earth revolves around the sun is not needed to pay the bills or even to tell time. Navigating a fictional world is likely very similar. We may not have at our fingertips all the facts that are true of the fictional world at any given time, but can supply them if asked explicitly, as in this study. Future work should test whether there are indeed such parallels between the processing of fictional and nonfictional information, to see whether our representational processes and our inference processes operate in the same way on these two types of information (see Nichols and Stich, 2000).

Such studies can help us to discover not only how subjects construct representations of stories, but also which facts they find most central to their representation of the real world. In the current study, we found that mathematical and scientific facts are generally invariant across possible worlds, while facts about social behavior are more malleable. The best way to explain these results is by appealing to the necessity of certain facts to people's representations of the real world. Scientific facts are more necessary and less easily counterfactualized, whereas conventions can vary even within the real world, and are hence more readily discarded in the creation of a fictional world.

An extreme version of this differential treatment of facts would hold that certain facts cannot possibly be counterfactualized when we create fictional worlds. This phenomenon is known as the *puzzle of imaginative resistance* (Gendler, 2000, 2006; Weinberg and Meskin, 2006; see also Matravers, 2003; Stock, 2005). When an author tries to write a story that violates one of these facts, usually those about laws of logic and moral behavior, readers will refuse to imaginatively engage with the story or to create an appropriate fictional world. Resisting entering imaginatively into a world that violates one of these central facts is an extreme response, but it is on a continuum with subjects' performance with the mathematical facts in our study. Future research should

examine both the extreme imaginative resistance that occurs in response to violations of moral or mathematical rules, and also the less extreme resistance to changing facts about science. Such research can help us to gain insight into what people believe to be causally central to the representation both of fictional worlds and of the real world.

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